Predicting Individual Wellbeing Through Test Scores: Evidence from a National Assessment in Mexico*

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Abstract

We construct two longitudinal datasets that record students' test scores in a national standardized exam in Mexico and track students from the end of primary school (grade 6) to the end of lower (grade 9) and upper (grade 12) secondary school; and from grade 12 to university enrollment and labor market participation up to three years after graduation from upper secondary school. Our results show that test scores are a strong predictor of future education and labor market outcomes. Test scores in grade 6 predict on-time enrollment and, conditional on this, test scores in grades 9 and 12, while test scores in grade 12 predict university enrollment and, conditional on employment, hourly wages. These results show that, despite its limitations, large-scale standardized tests can capture skills that are important for individual wellbeing.

JEL Codes: I20, J24.

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1 Introduction

There is an increasing recognition that education brings about individual and society-wide benefits if students acquire a relevant set of skills during their formative years, and that numeracy and literacy stand out among this set of skills. Numeracy and literacy are seen as the foundation for the acquisition of other skills and a direct determinant of education, health and labor market outcomes, among other benefits. However, there is less agreement about whether and how we can measure these skills among the population in a systematic and reliable way.

Standardized tests are one way to directly measure skills, and, in fact, many countries have adopted standardized testing in large-scale student assessments during the last years (Ganimian and Koretz, 2013). The increased availability of test scores in developing countries has contributed to the creation of social awareness on the importance of numeracy and literacy and its low proficiency levels, especially among disadvantaged children. Social awareness about low learning can stimulate demand for change and provide governments with legitimacy to design and enact education reforms. However, critics of standardized tests argue that these promote a "reductionist" approach of education, emphasizing literacy and numeracy in detriment of other equally important subject areas. Moreover, critics point out that the reliability of standardized test scores is doomed by either the presence or absence of incentives. On the one hand, the institutional focus on test scores can create perverse incentives that lead to "gaming" or "teaching to the test", without true improvements in learning.[1] On the other hand, the concern is that students do not put enough effort to answer the test if no consequences at all are attached to the results. Hence, given their potentially limited scope and imperfect set of incentives, it seems important to ask: can standardized tests capture skills in a meaningful way? Can standardized test scores be used to predict future education trajectories and labor market outcomes? Are standardized tests results in early grades reliable indicators

[1] For evidence on strategic behavior see Koretz and Barron (1998) and Deere and Strayer (2001).

of drop out risk and the accumulation of further skills?

To tackle these questions, we construct two longitudinal datasets that track students along their education trajectories and through the school to labor market transition. These datasets are among the first of this kind in a developing country. In specific, we use information from ENLACE, a census-based standardized test that primary and secondary school students in Mexico would take from 2006 to 2013. Our first dataset tracks students who took the test at the end of primary school (grade 6) in 2007 to the end of lower (grade 9) and upper (grade 12) secondary school in 2010 and 2013, respectively. For our second dataset, we merge grade 12 test scores to a special module of the Mexican labor force survey (ENOE) applied to individuals aged 18 to 20 years old in 2010.

Our results show that, despite their potential limitations, large scale standardized tests can capture skills with strong predictive power for future education and labor market outcomes. Sixth-grade learning outcomes predict lower- and upper-secondary on-time graduation and test scores. The magnitude of the correlation is far from trivial: a one-standard-deviation (SD) increase in grade 6 test scores increases the probability of on-time lower secondary graduation by 10 percentage points and (conditionally on this) increases learning outcomes by 0.7 SD. The association between grade 6 test scores and grade 12 outcomes is even larger: grade 6 kids with 1-SD higher scores have a probability of graduating on time 14 percentage points higher and, among those graduating on-time, they get 0.7 SD higher test scores. These results are robust to the inclusion of socio-economic controls and school-level fixed effects. In addition, our results show that grade 12 test scores are a good predictor of college entrance and, conditional on employment, hourly wages. A 1-SD increase in grade 12 test scores is correlated with a 10 percentage-point increase in the likelihood of being enrolled in university. Conditional on working, individuals with 1-SD higher test scores in grade 12 enjoy wages that are 6 percent higher, even after controlling for upper secondary school GPA and other socio-economic

variables.

To the best of our knowledge, this is the first piece of evidence on the association between test scores and future education and labor market trajectories in developing countries. Along the same lines, evidence from high-income countries show that achievement levels in test scores are good predictors of future education and labor market trajectories. For instance, using longitudinal data from the US, Rose (2006) and Jencks and Phillips (2011) show that high school test scores are positively correlated with earnings 7 and 10 years in the future, respectively. Murnane et al. (1995) show that, between the 1970s and the 1980s, the correlation between math test scores among high school seniors and future earnings experienced a significant increase. Rivera-Batiz (1992) found a correlation between math test scores and the likelihood of securing a full-time job. A positive correlation between test scores, particularly math, and future labor marker outcomes, has been documented also for the UK (Currie and Thomas (2001)) and Sweden (Lindqvist and Vestman (2011); Meghir et al. (2013)). But high school test scores, are, in turn, predicted by test scores at earlier grades therefore early grade test scores can, in principle, predict labor market outcomes. Chetty et al. (2011) show that test scores at kindergarten are a good predictor of college attendance, earnings at age 27, home ownership and savings for retirement.

Our results have important implications for education policies in developing countries. First, even if imperfect and limited in nature, large-scale standardized tests are a powerful tool to capture relevant skills for education and labor market trajectories, hence countries should invest in the design and implementation of this type of instruments. Second, results from large-scale assessments, especially those for early grades, should be used to target resources towards schools serving students with the lowest learning levels–which tend to be the poorest.

The paper is organized in the following way. Section 2 describes the ENLACE national examination and the steps followed to construct the longitudinal data.

Section 3 of the paper describes the empirical approach followed to study the relationship between test scores and future education and labor market trajectories. Section 4 presents the results and, finally, Section 5 presents the policy implications and recommendations.

2 Constructing education and labor market trajectories

We construct two longitudinal datasets for the analysis: 1) the ENLACE panel and 2) the ENILEMS-ENLACE panel. The first follows a cohort of students and records their test score at the end of primary school (grade 6) in 2007, end of lower-secondary school (grade 9) in 2010 and end of upper-secondary school (grade 12) in 2013. The second dataset merges a special module of the Mexican labor survey "Encuesta Nacional de Empleo y Ocupaciones", ENOE, applied to individuals aged 18, 19 and 20 years during the third quarter of 2010 with students that sat ENLACE grade 12 in 2008, 2009 and 2010.

2.1 ENLACE

From 2006 to 2013, the Mexican Secretariat of Public Education (SEP) applied the census-based standardized test "Evaluación Nacional de Logro Académico en Centros Escolares", ENLACE. The test gathered information at the end of each academic year on student performance in math, Spanish and a rotating subject for all third to ninth graders in private and public schools. Starting in 2008, ENLACE was also applied to students finalizing upper secondary school or grade 12. ENLACE was originally designed as a low-stakes assessment and had no bearing for students on GPA, graduation or admission. Nonetheless, the take up of the test was consistently around 90% (Figure 1). A total of 15.1 million students in 136,000 schools took the examination in 2013, the last year when ENLACE was applied.

The purpose of ENLACE was to strengthen school accountability by informing parents and the society at large about the levels and evolution of learning outcomes. Every year ENLACE results made it to the front page of most newspapers in Mexico; organizations of the civil society were empowered and sometimes even encouraged to form thanks to ENLACE results. In an effort to use all the information produced by ENLACE to guide school improvement plans, SEP invested a substantial amount of resources to produce school report cards and an online platform but few schools viewed ENLACE as a diagnostic tool hence limiting its effectiveness as an improvement strategy (de Hoyos et al. (2017)).

By design, ENLACE had a national mean score of 500 and a standard deviation of 100 for every subject area and grade. In addition, the test designers categorized test scores in four achievement levels: insufficient, elementary, good and excellent. ENLACE's methodology followed item response theory (IRT) allowing horizontal comparability of results (same grade over time), but not vertical comparisons (between grades). The implementation of ENLACE followed a predesign protocol involving parents as watchers, external test coordinators hired by SEP and close to a million teachers as implementers.

In 2008, SEP decided to use ENLACE scores to measure teacher performance in Carrera Magisterial (CM), a national teacher incentive program that was in operation from 1992 to 2015. CM offered salary bonuses to primary and lower secondary school teachers who participated in professional development courses and agreed to be subject to a yearly evaluation. ENLACE scores were given a weight of 20 percent in the program's total score, a weight that was increased to 50 percent in 2011. Almost all eligible teachers participated in CM (Santibáñez et al. (2007)). This decision made of ENLACE a high-stakes test encouraging "strategic behavior" and, without the proper controls, resulted in grade inflation (see Contreras and Backoff (2014)).

2.2 ENLACE Panel

ENLACE recorded the unique personal identifier ("Clave Única de Registro Poblacional" or CURP) for all test takers enabling the construction of a panel of students with learning outcomes at different points in their education trajectory. In addition to learning outcomes, the ENLACE dataset included a school identifier, socioeconomic information for each school based on their geographical location,[2] age and sex of the student. Using the CURP, we merge the information from all grade 6 students who took the exam in 2007 with their results in 2010 (grade 9) and 2013 (grade 12) exams. We begin the panel in 2007 because of the relatively low take-up in 2006 and the lack of availability of the unique identifier in some States during that same year. From the 1.986.190 students who sat in the exam in 2007, we were able to identify 71% in the grade 9 exam in 2010 and 32% in the grade 12 exam in 2013 (see Figure).

The very large attrition observed in the panel is caused by (i) grade repetition delaying student trajectories, (ii) school drop-out, (iii) exam take-up rates less than 100% or (iv) imperfect matching due to administrative data and coding errors. If a large share of the attrition in the panel is caused by a low rate of test take-up or imperfect matching, we would not be able to identify accurately the effects of grade 6 test scores on lower- and upper-secondary graduation rates. To quantify the magnitude of the causes behind attrition, we use administrative data from the annual school census ("Formato 911") to estimate the expected survival levels given repetition and drop-out rates in lower and upper-secondary in each of the 32 Mexican States. Given the school trajectories reported by administrative data, 77% of the population that completed sixth grade in 2007 was expected to finish grade 9 in

[2]The National Population Council (Consejo Nacional de Población, CONAPO) ranks all localities (an administrative and / or geographic entity often more disaggregated than a municipality) in Mexico according to a marginality index, a weighted average of literacy, access to basic public utilities, household infrastructure and average wages. Rankings range from very high marginalization, high marginalization, medium marginalization, low marginalization, and very low marginalization. For methodological details regarding Mexico's marginality index, see www.conapo.gob.mx

2010 and 39% to graduate from upper secondary in 2013 (see Figure 1). Therefore, according to administrative data, there is a 9 and 8 percentage points higher survival or graduation rate in lower- and upper-secondary, respectively, with respect the survival rate in our ENLACE panel. Lower than perfect test take-up, 87.3% of the population finishing lower secondary in 2010 and 89.4% of the population finishing upper secondary in 2013, reduces an additional 6% the survival rate in our panel, explaining a large share of the difference between survival rates in the ENLACE panel and administrative data. The difference between graduation or survival rates between the ENLACE panel and administrative data is not trivial (9 and 8 percentage points, respectively) but it is reassuring that most of the attrition observed in the ENLACE panel is explained by grade repetition and school dropouts, which is what we want to explain in this paper.

Two additional issues should be addressed. First, the States of Oaxaca and Michoacán are excluded from the panel as they had considerably low test take-up rates in 2007 (65% and 49%, respectively) and even lower in 2010 (34% and 0.7%). Second, the States of Nuevo Leon, and to a lesser extent Coahuila and San Luis de Potosi have 2-year upper secondary schools (as oppose to the 3 years for the rest of the country) reducing substantially the matching between lower and upper-secondary students in these states.

ENLACE included a context questionnaire which was applied to a random sample of students (and parents in the case of primary and lower-secondary), gathering information on socioeconomic characteristics, schooling aspirations and studying habits. Although the sample size relatively large[3], as it will be shown in the results section, including this information as controls reduces considerably the number of observations in the regression analysis.

Table 1 presents summary statistics for the sample of the ENLACE panel dataset. A simple comparison of means across the first 3 columns in Table 1 indicates that

[3] 7.557 observations for students and 13.766 for parents surveys in grade 6.

students who graduate on time from lower- and upper-secondary are more likely to have higher test scores at grade 6, to be female and to be enrolled in a private school. Figure 3 investigates further these patterns by plotting local means of enrollment and test scores in secondary school by ENLACE score deciles in sixth grade. Test scores in primary school have a large and positive correlation with enrollment and test scores in secondary school. The differences in outcomes between students in the top and bottom of the test score distribution in sixth grade are startling. For example, less than 20% of students in the bottom decile of the test score distribution sixth grade are enrolled in grade 12 six years later, vis-a-vis more than 50% of students in the top decile.

2.3 ENILEMS - ENLACE

Every quarter, the Mexican statistics office, INEGI, collects labor market information through the "Encuesta Nacional de Ocupación y Empleo" (ENOE), a nationally- and State-representative rotating household survey.[4] Every quarter ENOE's core survey is complemented by thematic modules usually capturing a demand for information from different Secretariats and Government agencies. During the third quarter of 2010 (July to September) ENOE's special module was the "Encuesta Nacional de Inserción Laboral de los Egresados de Educación Media Superior" (ENILEMS) a survey targeting upper secondary school graduates aged 18, 19 and 20. The objective of ENILEMS is to understand better the transition between the end of mandatory schooling (grade 12) and higher education or the labor market.[5]

The ENILEMS-ENLACE panel merges information from the respondents of the ENILEMS 2010 survey to their results in ENLACE grade 12 sat in may of 2008, 2009 or 2010. ENILEMS 2010 included all the necessary information to create a pseudo-CURP formed by name, sex, age and State were the individual was born. The only difference between the pseudo-CURP and the CURP is that the former does not

[4]For more information on ENOE, see http://www.beta.inegi.org.mx/proyectos/enchogares/regulares/enoe/.
[5]For more information on ENILEMS, see http://www.beta.inegi.org.mx/proyectos/enchogares/modulos/enilems/.

have the last three digits which are generated by the Mexican Government. We created the pseudo-CURP for 7,105 observations included in ENILEMS 2010 using the official algorithm for generating the CURP[6] A simple merge between ENILEMS and ENLACE grade 12 using the pseudo-CURP and CURP, respectively, was able to match 2,820 observations (40% of ENILEMS sample). An additional 18% of the sample was recovered manually by identifying coding or registration errors in the CURP generation process (i.e. errors in birth date, names misspelling). Overall, 58% of the individuals in ENILEMS sample were matched to their ENLACE grade 12 test score and after eliminating missing observations in ENLACE score, the panel reaches a total of 3,871 observations. The ENILEMS-ENLACE panel also includes the information from ENOE for all 3,871 matched observations plus information from ENLACE's context questionnaire for 13% of the panel.

Table 3 presents summary statistics for the ENILEMS-ENLACE panel dataset. Columns 2 and 3 in Table 3 decompose the sample into those who are enrolled in college and those who are not. Individuals enrolled in college have on average considerably higher ENLACE test scores than individuals out of college (by around .38 SD), but they are also more likely to have a higher GPA in upper secondary, to have been graduated from a private secondary school and to live in a urban area. Interestingly, around 26% of college students are employed versus 58% of those out of college. Actually, 44% of the employed individuals are also college students (see column 4).

Figure 7 shows average ENLACE test scores in mathematics and Spanish (at the end of secondary school) by college field of studies. Students in natural sciences and health tend to have higher test scores in both Spanish and math than the rest of the college students, which indicates that there is a selection of higher ability students to these majors. Second, engineering students have higher math test scores

[6]The CURP is a 18-digit unique personal identifier formed by a combination of letters and numbers taken from the individual's full name, date of birth, sex and State of birth, plus a three-digit code assigned by RENAPO, the Mexican population council. For more information, see https://renapo.gob.mx/swb/

on average, but not Spanish. This pattern indicates that engineering students tend to enroll in college degrees that match better their stock of skills. Finally, students in Social Sciences, Education and Management tend to have lower test scores in both Spanish and math. To our knowledge, this is the first piece of evidence about how college students sort by ability into different higher education fields in Mexico.

3 Methods

3.1 Econometric model

We are interested in the predictive power of ENLACE test scores over future schooling and labor market outcomes. In particular, we are interested on the link between test scores and three outcome variables: future attainment and achievement and labor market outcomes including employment and wages. With this purpose in mind, we write the following general model:

$$y_i = \beta_0 + \beta_1 enlace_i + \beta_k X_i' + \epsilon_i \tag{1}$$

In which y_i denotes an outcome of individual i, $enlace_i$ is the individual's ENLACE test score in grade 6 as a predictor of future education outcomes or test scores at grade 12 as a predictor for labor market outcomes or university entrance. X_i' is a vector of k student and household characteristics and ϵ_i is a disturbance term. Our main parameter of interest is β_1.

We use the ENLACE panel to study the relationship between grade 6 test scores and the probability of on-time graduation from lower- and upper-secondary school, proxied by observing student "i" sitting ENLACE grades 9 and 12, respectively. We also use the ENLACE panel to examine the relationship between grade 6 test scores and test scores 3 and 6 years later, conditional on sitting the tests.

The ENILEMS-ENLACE panel is used to examine the relationship between

grade 12 test scores and university enrollment and, conditional on not being enrolled in university, labor market outcomes. The labor market outcomes included in our analysis are the probability of being employed–conditional on not being enrolled in college, the logarithm of the hourly wage and the probability of having a formal job–these two last ones, conditional on being employed.

Education achievement is measured using an aggregated ENLACE test score, the simple average of the math and Spanish scores, in our main specification. However, math and Spanish test scores are used in separate regressions and the results are presented in the online Appendix. To control for differences in initial family inputs (F_0), we include grade 6 school fixed effects in all regressions using the ENLACE panel dataset. A specification using the sample of ENLACE who answered the context questionnaire is used to control for differences in household characteristics including both maternal and parental education (graduation from lower secondary school or not) and occupation (having a blue- versus white-collar occupation), among others. In the ENILEMS-ENLACE panel regressions, X_i' includes senior secondary school grade point average (GPA), a dummy variable indicating graduation from a private upper secondary school, residence in an urban area, sex and age.

We estimate equation 1 using OLS. Because several of our outcomes are binary variables (e.g. graduating on time from high school, enrolling in University, etc) one could be worried about potential biases introduced in the estimation of β_1 due to the linear projection of test scores. As a robustness check, we run a Probit model for the binary outcomes, which does not impose linear parameters as the OLS model and limit the predicted values of the dependent variable to the interval [0,1].

3.2 Empirical challenges

The interpretation of the results presented in the following section could be challenging due to relevant variables being omitted from the analysis. ENLACE test scores are likely not independent of other student characteristics which are, in turn,

important determinants of education and labor market trajectories. For instance, math scores might be correlated with socio-emotional skills like motivation or perseverance that produce higher test scores today and better attainment, achievement and labor market outcomes in the future. This type of omitted variable bias is not necessarily a limitation of our empirical strategy since the objective of our exercise is not the identification of the effect of an exogenous change in, say, math skills holding constant all other student characteristics, but instead we want to measure the predictive power of basic skills, captured by test scores, for future wellbeing. Test score outcomes will surely be the result of a combination of previous subject-specific knowledge–as described in our conceptual framework above, and socio-emotional skills. But if test scores are a good proxy to identify children at risk of dropping out or not acquiring fundamental skills and having difficulties accessing the labor market, then standardized tests would be a very useful and powerful tool to reduce inequities. Nonetheless, in Section 4 we discuss what are the skills that ENLACE does capture and propose an empirical strategy to identify the impacts of changes in subject-specific skills versus other characteristics such as personality traits of socio-emotional skills.

A second empirical challenge is if test scores only correlate with future outcomes because they only capture the structural correlation between family background, schooling and labor market outcomes rather than basic or fundamental skills. We use the richness of our datasets to deal with this potential omitted-variable bias. In the case of the analysis using the ENLACE panel, the vector X' includes several controls for family background and school at grade 6 fixed effects. Given that school stratification by family background is likely important in this context, the inclusion of sixth grade school fixed effects should address many of the concerns about the presence of socio-economic status inβ_1.

4 Results

4.1 Grade 6 ENLACE and secondary school outcomes

Table 2 reports the results of regressing enrollment and test scores in grades 9 and 12 (columns 1 to 4) on ENLACE test scores at grade 6, a dummy for whether the student is a female and a vector of grade 6 school fixed effects. Given that school stratification by family background is important in this context, the inclusion of school fixed effects should address many of the concerns about omitted socio-economic variable potentially introducing a bias in $\hat{\beta}_1$.

In line with the relationship suggested by the descriptive stats presented in Table 1 and Figure 3, we find a strong association between ENLACE test scores at grade 6 and enrollment in grades 9 and 12, even after controlling for school fixed effects and gender. One standard deviation (SD) increase in ENLACE test scores at grade 6 is associated with an increase in 10.2 percentage points and 13.5 percentage points respectively on the probability of on-time graduation from lower- and upper secondary school–both results are statistically significant at the one-percent level.

A similar story goes for future test scores. One SD increase in ENLACE test scores at grade 6 is correlated with a .71 SD increase in test scores in grades 9 and 12, respectively –conditional on taking the ENLACE exam, again these results are statistically significant at the one-percent level.

We estimate equation 1 including controls from ENLACE context questionnaire, which allows us to also control for parental education and occupation. Table 2 (columns 4 to 6) reports the results. We find similar results, ENLACE test scores at grade 6 are strong predictors of on-time graduation and test scores at grades 9 and 12, even after including in the model variables that directly control for family background. One SD increase in grade 6 test scores is associated with increases in 7.8 percentage points and 13 percentage points on the probability of on-time graduation, and with .66 SD and .63 SD increases in test scores in grades 9 and 12,

respectively. These results are also statistically significant at the one-percent level, despite being estimated with a much smaller sample.

There are clear gaps in outcomes by gender and socioeconomic background. Even conditional on the grade 6 score, girls are more likely to follow an education trajectory free of age-grade distortions, by around 4 percentage points–a difference statistically significant at the one percent level, see row 2 in columns 5 and 6. When looking at test scores though, the gender gap reverses by grade 12. Conditional on initial test scores (and staying on school), girls do better on average than boys in grade 9 (by .08 SD), but worse by grade 12 (by .15 SD). This surprising pattern is explained by girls worse performance in mathematics in twelfth grade (see 5 and Avitabile and De Hoyos (2015) for a discussion on this). Even though all of the between-school differences in socio-economic level will be captured by the school fixed-effects, students with more educated parents are more likely to stay in school on time, though we do not find a statistically significant (conditional) relationship with parental occupation. Having a more educated mother is much more important for a student's performance than father's education. For instance students with a mother with at least junior secondary education have higher test scores, but not with a more educated father.

Summing up, we find that test scores at the end of primary school are a large and robust predictors of on-time graduation and test scores in lower- and upper-secondary. Students in the bottom of the test score distribution in grade 6 face a larger risk of dropping out of school and staying with low levels of skills. Conditional on grade 6 test scores, there are clear gender and socioeconomic gaps in enrollment and achievement in secondary school.

4.2 ENLACE test scores and labor market outcomes

Are ENLACE test scores at grade 12 a good predictor of college enrollment and labor market outcomes 1, 2 or 3 years after graduation? We investigate the relationship

between test scores at the end of upper secondary (grade 12) and the probabilities of being enrolled in college and, conditional on not being a college student, being employed. Figure 5 (top panel) plots local means of both outcomes by ENLACE score deciles in grade 6. We find a strong and monotonic relationship between test scores and college enrollment. The gap in outcomes between people at the bottom and top of the test score distribution is startling. 90% of individuals in the top decile of the test score distribution study a college program, for just 45% of those in the bottom decile. In contrast, we do not find that test scores predict employment status among those individuals who are not enrolled in college. The conditional expectation function of employment on test scores seems to have a flat profile (though it gets less precise in the top part of the distribution, because there is few people at this level of ENLACE out of college). Figure 5 (bottom panel) also depicts the relationship between test scores and employment characteristics among the employed. We observe here that test scores predict higher wages, particularly in the top half of the score distribution (with the exception of the top decile, but because only 20% of individuals in this decile work, we have less precision here). There seems not to be a statistical association between test scores and the probability of being employed in the formal sector of the economy (conditional on being employed).

To estimate if the predictive power of test scores at grade 12 over college enrollment and wages is robust to the inclusion of controls we ran an alternative specification. Table 4 reports the results of regressing post secondary school outcomes on grade 12 test scores, GPA for upper secondary, indicators for whether the individual is a female, a graduate from a private high school and a urban resident, plus a vector of state and year of birth fixed-effects. We find a strong relationship between test scores and college enrollment (see column 1). A 1-SD increase in the ENLACE Score is associated with a 10 percentage point increase in the probability of college enrollment (a result statistically significant at the one percent level). The GPA in upper secondary school is also positively associated with college enrollment.

A 1-SD increase in the former predicts an increase of 7 percentage points in the later, with statistical significance at the one percent level.

It stands out that conditional on these two measures of ability, females are 5 percentage points less likely to be enrolled in college (statistical significant at the ten percent level) and graduates from private secondary schools are 11 percentage points more likely to be enrolled in college (statistical significant at the one percent level). In other words, holding constant test scores and secondary school GPA, there is a gender and family background gap in college enrollment against women and public school graduates.

Estimates in column 2 confirms that –among those individuals out of college– there is no association between test scores and employment status. Among those employed, we do not find that test scores have predictive power over being employed in a formal firm (see Column 4). However, among those employed, test scores have a large and significant relationship with future hourly wages. As reported in Column 3 of Table 4, a 1-SD increase in test scores is associated with an increase of around 7 percent in the (hourly) wage.

In summary, we find that test scores at the end of secondary school predict college enrollment and (for those individuals employed) hourly wages. This relationship is robust even when controlling for upper secondary GPA and graduation from a private senior secondary school (a proxy for family background). We also find that, conditional on test scores and upper secondary GPA, women and graduates from public schools are less likely to be enrolled in college.

4.3 Robustness checks

As discussed in Section 3, the estimation of a linear probability model, as done so far, could lead to potential biases in $\hat{\beta}_1$ due to the linear projection of test scores. To address this concern we estimate Probit regressions for our binary outcomes, using the same variables that in the OLS estimation. Table 5 reports coefficients

(columns 1-2) and marginal effects (columns 3-4) for the binary outcomes in the Enlace Panel (on time enrollment in grades 9 and 12) and Table 6 reports coefficients (columns 1-3) and marginal effects (columns 4-6) for the binary outcomes in the ENLACE-ENILEMS Panel: college enrollment, probability of being employed and probability of being employed in a formal firm. Marginal effects are evaluated at averages values of the continuous variables. In both cases, results are similar to those presented in the previous subsection. We find a positive and strong (statistically and economically) relationship between test scores at grade 6 and on time graduation in grades 9 and 12. The same is true for the relationship between test scores at grade 12 and college enrollment. The probit results show that test scores at grade 12 do not predict the conditional probability of being employed nor being employed in a formal firm, which is consistent with the OLS results reported above.

Complementarily, we also estimate equation 1 using an alternative specification in which ENLACE continuous test scores are substituted with the achievement levels in Spanish and mathematics (insufficient, elementary, good and excellent) defined by the test designers. In specific, we replace the variable $enlace_i$ with a vector of dummies for three of the four achievement levels. This saturated OLS regression should deal with concerns about potential bias in β_1 due to the linear projection of test scores and is also interesting per se because these achievement levels were widely used in the dissemination of the Enlace results to the general public. We obtain qualitatively similar results to those reported here (see results in 5).

4.4 What do test scores capture?

In Section 3, we discussed that, even holding constant a student's socioeconomic status, Enlace scores could capture both the numeracy and literacy skills that the test is designed to measure and other unobservable skills that also produce higher test scores, such as motivation or other non-cognitive skills. We already found some evidence against this scenario in the results presented in subsection 4.2. Table 4

showed that test scores in grade 12 are related to college enrollment and wages (conditional on being employed) even controlling for upper secondary GPA (a proxy of multi-dimensional, socio-emotional, skills). Nonetheless, we turn now to investigate further this issue. To fix ideas, suppose the production function of test scores is:

$$enlace_{it}^{s} = \alpha_0 + \alpha_1 c_{it}^{s} + \alpha_2 nc_{it} + \alpha_k X_i + e_{it} \tag{2}$$

Where $enlace_{it}^{s}$ is student i's test score in subject s at time t, c_{it}^{s} is i's cognitive ability in subject s at time t, nc_{it} is i's non-cognitive ability at time t, X_i is a vector of i's individual and family characteristics and e_{it} is a random disturbance term. If $\alpha_2 > 0$, the interpretation of our main parameter of interest (β_1 in equation 1) as the effect of skills in subject s at time $t-1$ on current outcome y_{it} is problematic. In other words, if non-cognitive skills produce both better test scores and better education and labor market trajectories, onen cannot inter[pret the effect of test scores on future outcomes as the pure effect of cognitive skills. Now, if test scores in two different subjects (say math and language) are available, one can estimate:

$$enlace_{it}^{math} = \beta_0 + \beta_1 enlace_{it-1}^{math} + \beta_2 enlace_{it-1}^{language} + \beta_k X_i + \epsilon_{it} \tag{3}$$

Equation 3 is a modified version of our main specification that allows us to study the effect of student i's test score in a particular subject area at grade 6 on the score for the same subject area in grades 9 and 12 *controlling for her grade 6 score in the other subject area*. Under the asumption that the effect of non-cognitive skills on math and laguage test scores is similar, β_1 can be interpreted as the effect of math (language) skills at greade 6 on math skills at grade 9 and 12 holding constant non-cognitive skills (as plugging equation 2 into 3 shows).

Table 7 reports the results of estimating equation 3. Both math and Spanish scores in grade 6 predict scores in those same subject areas in grades 9 and 12, even

when controlling for the grade 6 score in the other subject area. The coefficients of interest (see rows 1 and 4) have a large statistical and economical significance. We interpret this as evidence that Enlace measures basic cognitive skills (numeracy and literacy) that are important for future schooling and labor market outcomes.

5 Conclusions

Using the Mexican census-based standardized test ENLACE we construct a longitudinal dataset tracking students' completion and test scores in grades 6, 9 and 12. Our analysis shows that higher test scores at sixth grade have a large, significant and long-lasting effect on the student's likelihood of finishing lower- and upper-secondary on time and their test scores levels. A reduction of 1-SD in test scores in sixth grade reduces in 13 percentage points the probability of graduating from upper secondary, and, among those who graduated, it reduces test scores by 0.70 SD. We present compelling evidence that these effects are driven by the levels of subject-specific knowledge at sixth grade (as captured by the standardized test) rather than by unobservables such as socio-emotional skills. Furthermore, the effects are robust to different estimation models, the inclusion of controls for socioeconomic characteristics and sixth-grade school fixed-effects.

The paper also assesses the short-term effects of basic skills, captured by grade 12 test scores, on post-secondary outcomes such as university enrollment, employment in the formal sector and hourly wages. For this objective, we merge upper secondary ENLACE test scores with a labor market survey following students 1 or 2 years after graduation. Our results show that test scores are a strong and positive predictor of university enrollment, and, conditional on not being enrolled and being employed, it also correlates positively with hourly wages. A positive change of one standard deviation in test scores at the end of upper secondary is associated with a 10 percentage point increase in the likelihood of enrolling in university and, con-

ditional on being employed, it increases 6% hourly wages. We found no significant effects of grade 12 test scores on the likelihood of being employed in the formal sector. All these results are robust to the inclusion of socio-economic controls, state and year of birth fixed-effects and upper secondary grade point average (GPA).

The significant effects on wages are somehow surprising considering that all the individuals in our panel have the same years of schooling and, for many of them, is their first job. So our estimates on the effects of test scores on math can be seen as controlling for the signaling theory, since all of them are upper secondary graduates who did not go to university. Most likely, the effects of upper secondary test scores on wages that we report above is a lower bound estimate of the medium- and long-run effects. This would be the case if, for instance, employers have imperfect information about the applicant's true skills (among high school graduates), and they learn progressively about those skills as workers spend more time in the workplace. A second possibility for expecting a larger association between test scores and wages in the medium- to long-term is if individuals accumulate human capital in the workplace, enabling those with relatively high test scores to get more workplace human capital therefore increasing their wages.

These results shed light on how disadvantages at early stages in the education trajectories have important and persistent implications for future education and labor market outcomes. The concept of learning begets learning is corroborated by the evidence presented here showing that a low learning outcome in sixth grade can have a negative consequence in personal incomes 10 years latter working its way through lower chances of completing upper secondary and, if graduating, reducing learning outcomes which, in turn, reduces the individual's probability of entering university, among those who do not enter, reducing wages. This should make a failing mark at the end of primary school–or earlier–an issue getting the attention it deserves and the necessary support. We believe that, despite their limitations, large scale standardized tests like ENLACE capture skills that are important for

wellbeing. Our findings support the rationale for using test score results as a proxy for identify students at risk and triggering the necessary remediation mechanism to reduce the path-dependency that we present here.

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Tables

Table 1: ENLACE Panel – Means and Standard Deviations

VARIABLES	(1) All	(2) College	(3) Out of College	(4) Employed
Enlace Score	0.213	0.375	-0.0630	0.114
	(0.854)	(0.856)	(0.778)	(0.808)
College Student	0.630	1	0	0.437
	(0.483)	(0)	(0)	(0.496)
Employed	0.379	0.263	0.577	1
	(0.485)	(0.440)	(0.494)	(0)
Upper Secondary GPA	-0.0219	0.135	-0.289	-0.0835
	(1.007)	(0.995)	(0.970)	(0.987)
Girl	0.564	0.546	0.596	0.502
	(0.496)	(0.498)	(0.491)	(0.500)
Private Upper Secondary	0.175	0.203	0.129	0.134
	(0.380)	(0.402)	(0.335)	(0.340)
Urban resident	0.848	0.912	0.740	0.814
	(0.359)	(0.283)	(0.439)	(0.389)
Age	19.18	19.16	19.21	19.23
	(0.701)	(0.688)	(0.723)	(0.697)
Observations	3,714	2,550	1,164	1,384

Notes: The table shows the mean and standard deviations of all students matched in the ENLACE panel in 2007 (column 1), 2010 (column 2) and 2013 (column 3). Column 4 displays additional variables from student and parents surveys that were applied to a sample of ENLACE takers.

Table 2: OLS – ENLACE test scores and secondary school outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Enrollment		Score		Enrollment		Score	
VARIABLES	Grade 9	Grade 12	Grade 9	Grade 12	Grade 9	Grade 12	Grade 9	Grade 12
Enlace Score Grade 6	0.102***	0.135***	0.709***	0.713***	0.0779***	0.129***	0.656***	0.626***
	(0.000374)	(0.000389)	(0.000793)	(0.00128)	(0.00694)	(0.00791)	(0.0155)	(0.0263)
Girl	0.0385***	0.0343***	0.0648***	-0.146***	0.0393***	0.0369***	0.0750***	-0.153***
	(0.000618)	(0.000646)	(0.00125)	(0.00202)	(0.0119)	(0.0136)	(0.0253)	(0.0409)
Mother has JHS					0.0501***	0.0646***	0.0775**	0.118**
					(0.0150)	(0.0170)	(0.0316)	(0.0498)
Father has JHS					0.0326**	0.0337**	0.0174	-0.0114
					(0.0156)	(0.0171)	(0.0323)	(0.0522)
Mother is white collar					0.00543	0.00542	0.0254	-0.0352
					(0.0179)	(0.0233)	(0.0417)	(0.0605)
Father is white collar					-0.00289	0.0217	0.0766**	0.131***
					(0.0147)	(0.0183)	(0.0331)	(0.0494)
Observations	1,986,190	1,986,190	1,414,848	640,892	4,672	4,672	3,595	1,728
R-squared	0.195	0.204	0.530	0.518	0.154	0.193	0.489	0.429
Mean Dep. Var.	0.712	0.323	0.00579	-0.000218	0.760	0.368	0.0608	0.0692

Notes: (1) The table displays results of the estimation of Equation 1 over the ENLACE panel (columns 1 to 4) and a restricted panel with available socioeconomic control variables from student and parents surveys in 2007 (columns 5 to 8). (2) Dependent variable is enrollment and test score in grades 9 and 12. (3) All specifications include school fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: ENILEMS-ENLACE panel – Means and Standard Deviations

VARIABLES	(1) All	(2) College	(3) Out of College	(4) Employed
Enlace Score	0.213	0.375	-0.0630	0.114
	(0.854)	(0.856)	(0.778)	(0.808)
College Student	0.630	1	0	0.437
	(0.483)	(0)	(0)	(0.496)
Employed	0.379	0.263	0.577	1
	(0.485)	(0.440)	(0.494)	(0)
Upper Secondary GPA	-0.0219	0.135	-0.289	-0.0835
	(1.007)	(0.995)	(0.970)	(0.987)
Girl	0.564	0.546	0.596	0.502
	(0.496)	(0.498)	(0.491)	(0.500)
Private Upper Secondary	0.175	0.203	0.129	0.134
	(0.380)	(0.402)	(0.335)	(0.340)
Urban resident	0.848	0.912	0.740	0.814
	(0.359)	(0.283)	(0.439)	(0.389)
Age	19.18	19.16	19.21	19.23
	(0.701)	(0.688)	(0.723)	(0.697)
Observations	3,714	2,550	1,164	1,384

Notes: The table displays the mean and standard deviations of several characteristics of all students matched in the ENILEMS-ENLACE (column 1), students that reported to be in college (column 2), out of college (column 3) or employed (column 4).

Table 4: OLS – ENLACE test scores and later outcomes

VARIABLES	(1) College Student	(2) Employed	(3) ln hourly wage	(4) Formal firm
Enlace Score	0.102***	-0.00750	0.0681**	-0.000444
	(0.0154)	(0.0297)	(0.0304)	(0.0298)
Upper Secondary GPA	0.0688***	0.0412*	-0.00579	0.00507
	(0.0146)	(0.0233)	(0.0268)	(0.0254)
Girl	-0.0500*	-0.237***	-0.0321	0.00994
	(0.0263)	(0.0442)	(0.0501)	(0.0478)
Private Upper Secondary	0.113***	-0.0962	0.0606	-0.0842
	(0.0320)	(0.0649)	(0.0736)	(0.0653)
Urban resident	0.269***	0.0373	0.0944*	0.137**
	(0.0375)	(0.0472)	(0.0535)	(0.0566)
Observations	3,705	1,162	1,020	1,020
R-squared	0.172	0.147	0.177	0.097
Birth Year Dummies	Yes	Yes	Yes	Yes
Birth State Dummies	Yes	Yes	Yes	Yes
Clusters	1778	822	706	706
Mean Dep. Var.	0.630	0.578	2.821	0.396

Notes: (1) The table displays the results of the estimation of Equation 1. (2) The dependent variables are labor market outcomes: a dummy indicating enrollment in college (column 1), a dummy indicating if employed (column 2), ln of hourly wage (column 3) and a dummy for being employed in a formal firm (column 4). (3) All specifications include age and State dummies and school fixed effects

Table 5: Probit – ENLACE test scores and enrollment in secondary school

	(1)	(2)	(3)	(4)
	Enrollment			
	Coefficients		Marginal Effects	
VARIABLES	Grade 9	Grade 12	Grade 9	Grade 12
Enlace Score Grade 6	0.234***	0.335***	0.0853***	0.110***
	(0.0298)	(0.0277)	(0.0101)	(0.0102)
Girl	0.178***	0.0851*	0.0648***	0.0280*
	(0.0499)	(0.0464)	(0.0191)	(0.0150)
Private School Grade 6	0.0638	0.120	0.0232	0.0396
	(0.176)	(0.146)	(0.0641)	(0.0479)
Mother has lower secondary school	0.282***	0.228***	0.103***	0.0750***
	(0.0529)	(0.0538)	(0.0204)	(0.0167)
Father has lower secondary school	0.201***	0.107*	0.0732***	0.0352*
	(0.0559)	(0.0606)	(0.0209)	(0.0193)
Mother is white collar	0.0522	0.0631	0.0190	0.0208
	(0.0693)	(0.0819)	(0.0253)	(0.0270)
Father is white collar	0.00467	0.0802	0.00170	0.0264
	(0.0678)	(0.0544)	(0.0247)	(0.0178)
Observations	4,672	4,672	4,672	4,672
Clusters	130	130		
Mean	0.712	0.323		

Notes: (1) The table displays the estimation of the probability of being enrolled in grades 9 and 12 given grade 6 tests scores and a set of socioeconomic variables. (2) Sample: Subsample of the ENLACE panel that has grade 6 students and parents surveys . (3) All specifications include school fixed effects

Table 6: Probit – ENLACE test scores and later outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficients			Marginal effects		
VARIABLES	College Student	Employed	Formal firm	College Student	Employed	Formal firm
Enlace Score	0.290***	-0.0550	-0.0335	0.114***	-0.0183	-0.0113
	(0.0506)	(0.0864)	(0.0806)	(0.0204)	(0.0288)	(0.0271)
Upper Secondary GPA	0.214***	0.129*	0.0449	0.0838***	0.0430*	0.0151
	(0.0433)	(0.0670)	(0.0640)	(0.0171)	(0.0223)	(0.0216)
Girl	-0.158**	-0.657***	-0.0429	-0.0618*	-0.219***	-0.0145
	(0.0800)	(0.132)	(0.128)	(0.0319)	(0.0363)	(0.0438)
Private Upper Secondary	0.254**	-0.294	-0.222	0.0998**	-0.0978	-0.0748
	(0.101)	(0.183)	(0.167)	(0.0395)	(0.0604)	(0.0574)
Urban resident	0.701***	0.0478	0.442***	0.275***	0.0159	0.149***
	(0.116)	(0.136)	(0.167)	(0.0405)	(0.0463)	(0.0454)
Observations	3,714	1,164	1,021	3,714	1,164	1,021
Clusters	1780	824	706			
Mean Dep. Var.	0.686	0.604	0.413			

Notes: (1) The table displays the estimation of the probability of being enrolled in college, employed, or employed in a formal firm given ENLACE grade 12 scores and a set of socioeconomic variables. (2) Sample: ENILEMS-ENLACE panel. (3) All specifications include school fixed effects

Table 7: OLS – ENLACE test scores and later test scores

	(1)	(2)	(3)	(4)
	Math Score		Spanish Score	
VARIABLES	Grade 9	Grade 12	Grade 9	Grade 12
Math Score Grade 6	0.360***	0.423***	0.209***	0.178***
	(0.0236)	(0.0343)	(0.0213)	(0.0363)
Spanish Score Grade 6	0.248***	0.144***	0.472***	0.456***
	(0.0242)	(0.0355)	(0.0227)	(0.0371)
Girl	-0.0159	-0.369***	0.144***	0.157***
	(0.0272)	(0.0421)	(0.0257)	(0.0422)
Mother has JHS	0.0554*	0.0793	0.0885***	0.140***
	(0.0336)	(0.0516)	(0.0324)	(0.0515)
Father has JHS	-0.00499	0.0215	0.0396	-0.0489
	(0.0346)	(0.0543)	(0.0330)	(0.0522)
Mother is white collar	-0.00831	-0.0169	0.0530	-0.0498
	(0.0437)	(0.0587)	(0.0417)	(0.0648)
Father is white collar	0.0575	0.114**	0.0815**	0.124**
	(0.0359)	(0.0496)	(0.0326)	(0.0513)
Observations	3,595	1,728	3,595	1,729
R-squared	0.397	0.394	0.486	0.398
Mean Dep. Var.	0.00522	-0.000960	0.00544	0.000785

Notes: (1) The table displays the estimation of the effect of early test scores on grade 9 and 12 test scores by subject. (2) Specifications for each subject and grade include as independent variables grade 6 test scores of the same subject and current test scores for the alternative subject. (3) Sample: Subsample of the ENLACE panel that has grade 6 students and parents surveys. (4) All specifications include school fixed effects.

Figures

Figure 1: ENLACE take-up

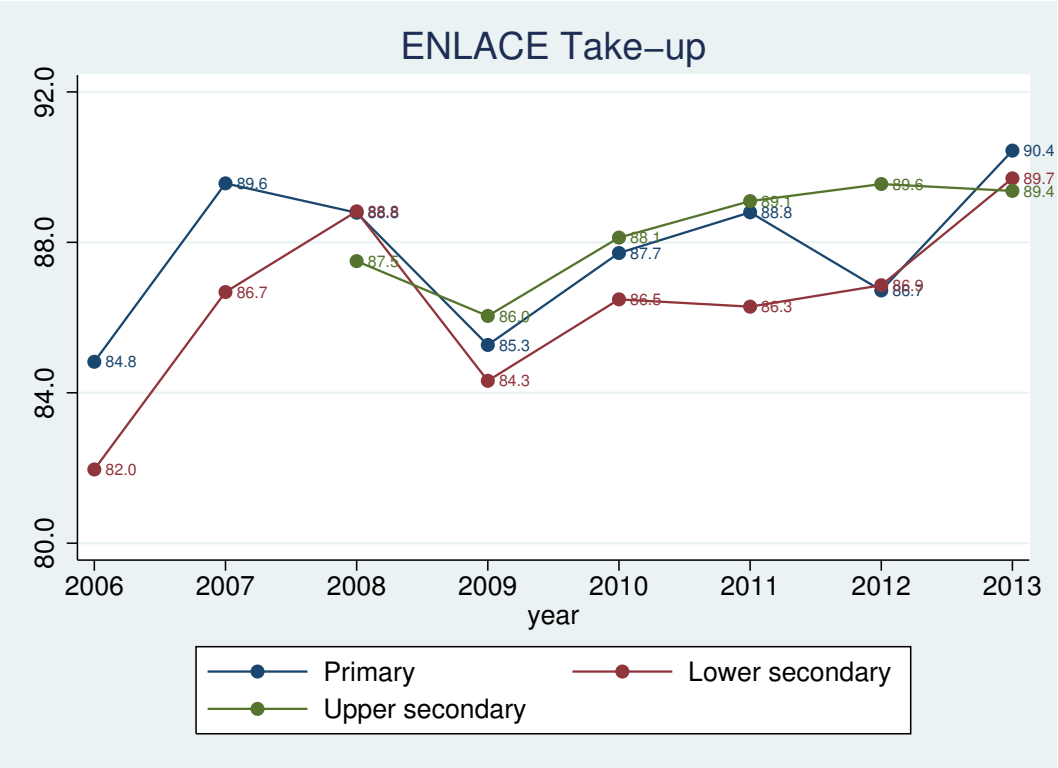

Figure 2: The graph presents the historical ENLACE take-up for all school levels: primary, lower and upper-secondary. Source: SEP.

Figure 3: ENLACE test scores and secondary school outcomes

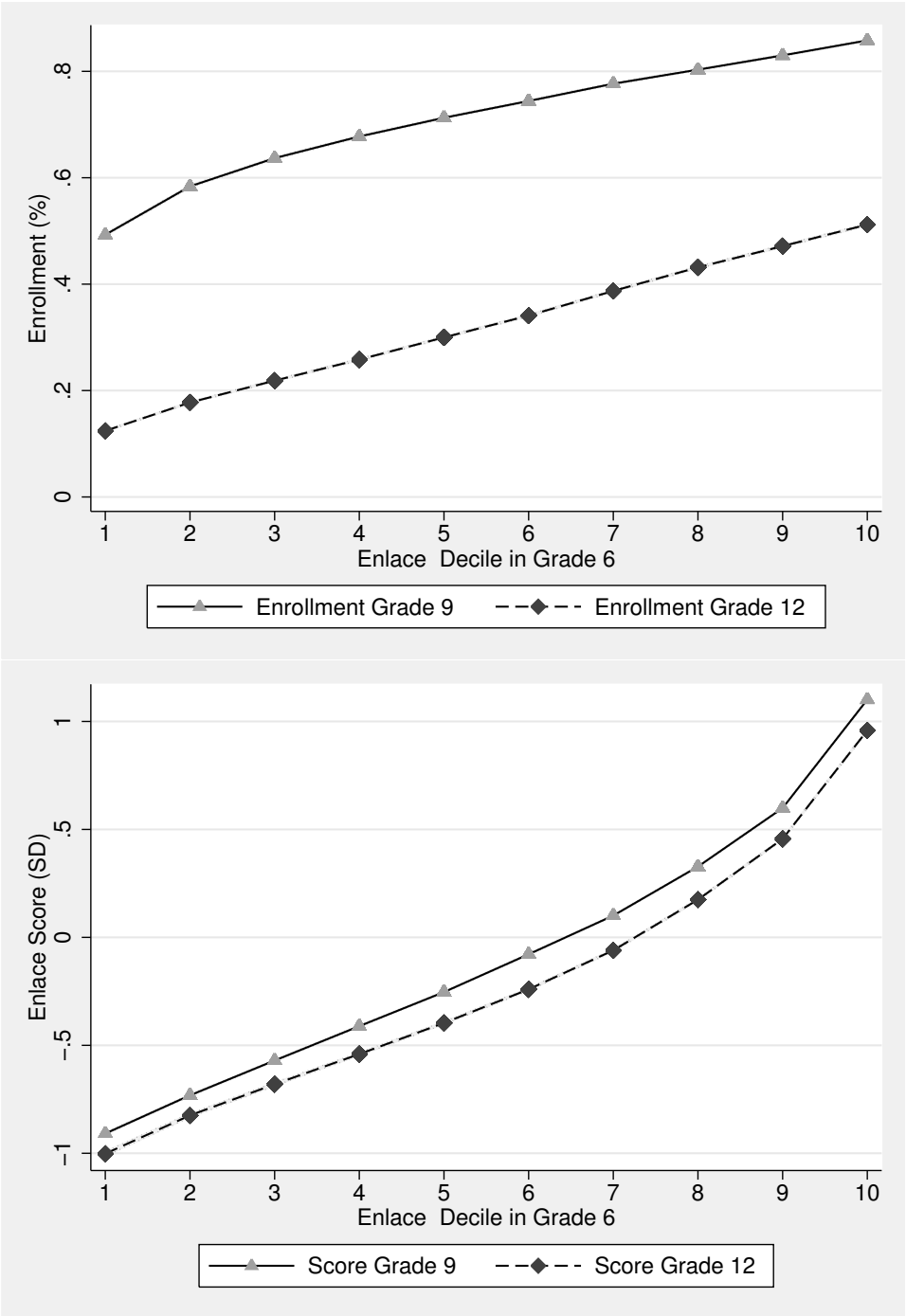

Figure 4: The graph plots ENLACE test scores in grade 6 by decile and later school enrollment and test scores. Data: ENLACE panel.

Figure 5: ENLACE test scores and post secondary school outcomes

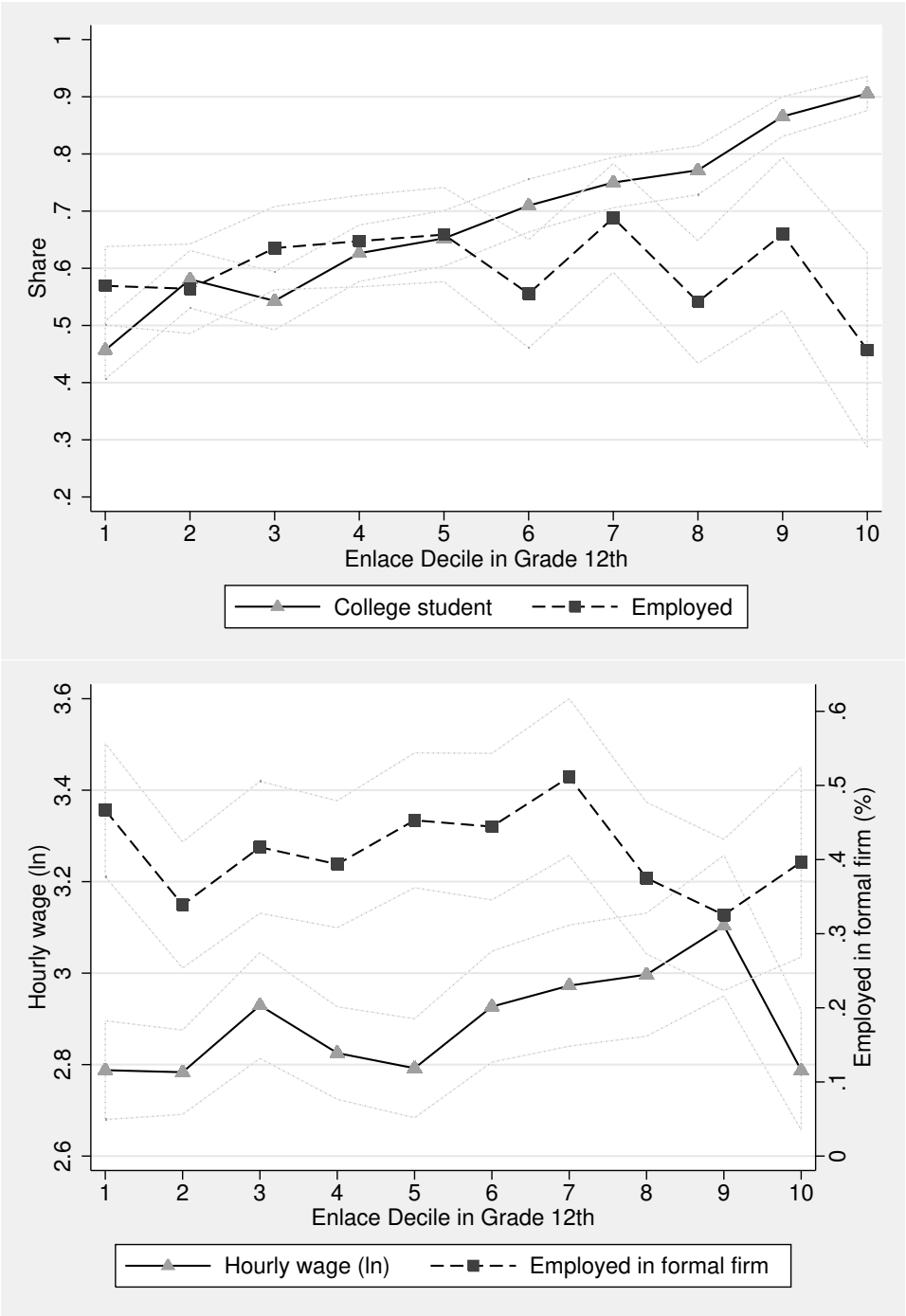

Figure 6: The graph plots ENLACE test scores in grade 12 by decile and later labor market outcomes. Data: ENILEMS-ENLACE dataset.

Figure 7: ENLACE test scores and college field of studies

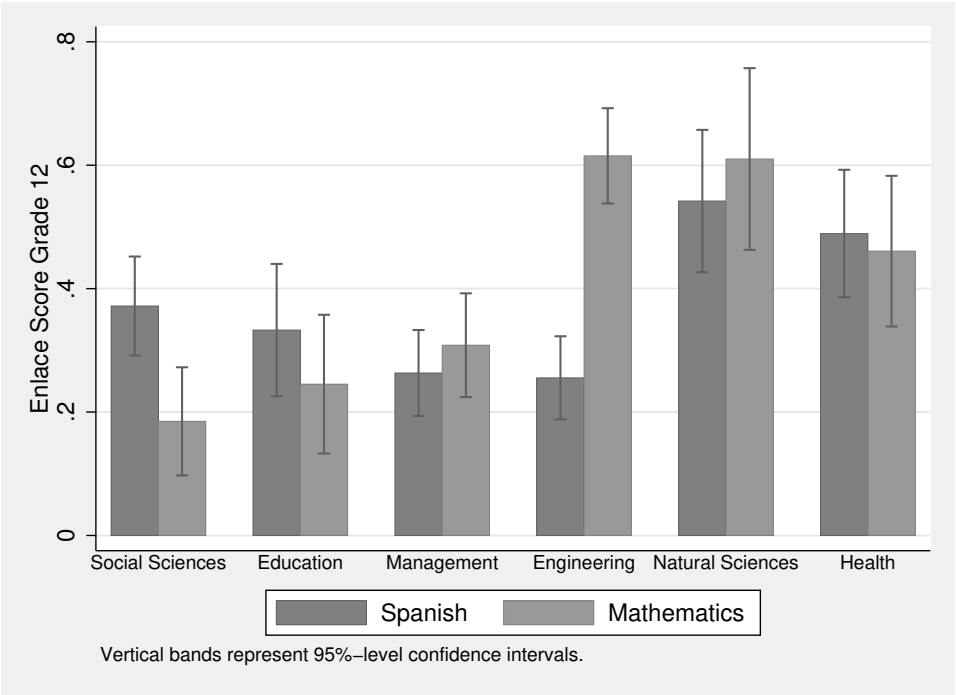

Figure 8: The graph plots ENLACE test scores in grade 12 by subject and the field of college studies. Data: ENILEMS-ENLACE dataset.

Appendix

Figure A.1: ENLACE achievement levels in Grade 6

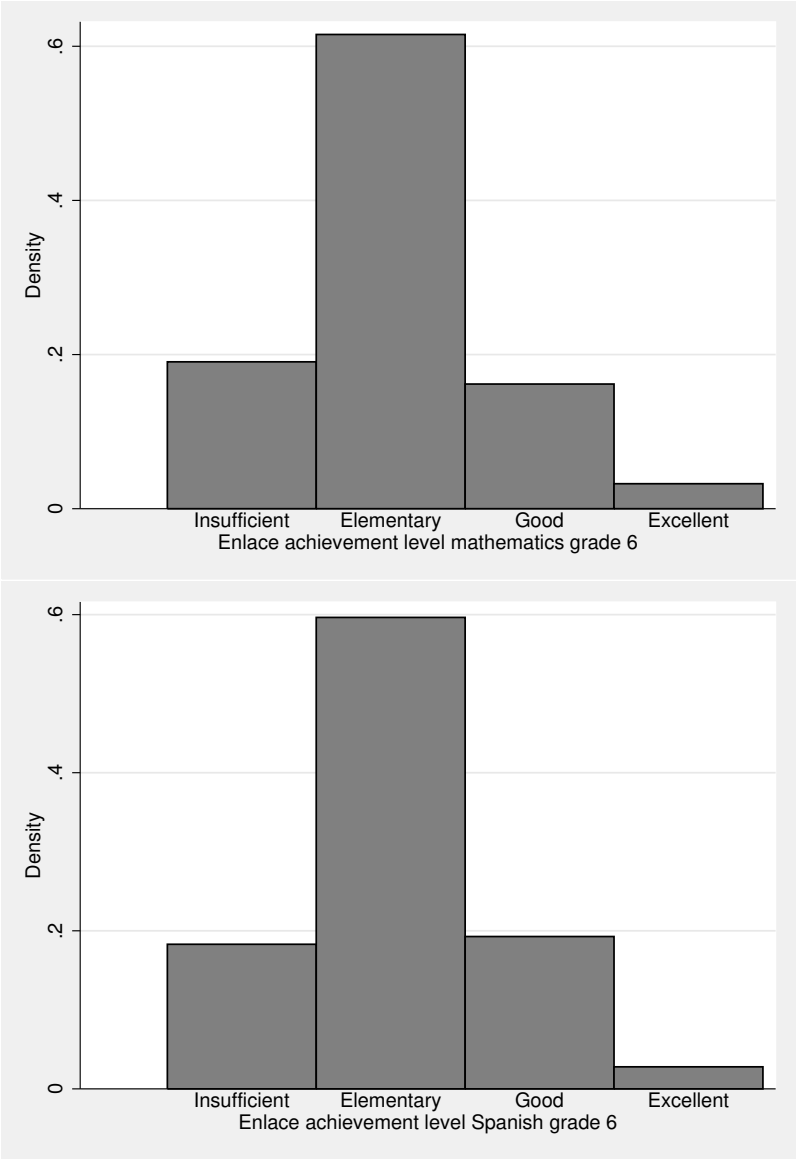

Figure A.2: The graph plots the distribution of ENLACE grade 6 scores by level.

Table A.1: OLS – ENLACE mathematics and Spanish test scores and secondary school outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Enrollment		Spanish Score		Enrollment		Math Score	
VARIABLES	Grade 9	Grade 12	Grade 9	Grade 12	Grade 9	Grade 12	Grade 9	Grade 12
Spanish Score Grade 6	0.0746***	0.115***	0.634***	0.593***				
	(0.00706)	(0.00797)	(0.0159)	(0.0265)				
Math Score Grade 6					0.0691***	0.121***	0.531***	0.520***
					(0.00671)	(0.00769)	(0.0162)	(0.0249)
Girl	0.0347***	0.0315**	0.121***	0.136***	0.0472***	0.0491***	0.0268	-0.347***
	(0.0120)	(0.0138)	(0.0260)	(0.0423)	(0.0119)	(0.0135)	(0.0274)	(0.0421)
Mother has lower secondary	0.0517***	0.0684***	0.0983***	0.155***	0.0519***	0.0664***	0.0629*	0.0775
	(0.0151)	(0.0171)	(0.0326)	(0.0520)	(0.0150)	(0.0170)	(0.0339)	(0.0518)
Father has lower secondary	0.0346**	0.0382**	0.0530	-0.0518	0.0342**	0.0351**	0.00165	0.0338
	(0.0156)	(0.0173)	(0.0334)	(0.0529)	(0.0156)	(0.0171)	(0.0351)	(0.0545)
Mother is white collar	0.00456	0.00502	0.0494	-0.0546	0.00824	0.00948	0.00499	-0.0133
	(0.0180)	(0.0235)	(0.0423)	(0.0652)	(0.0178)	(0.0232)	(0.0443)	(0.0594)
Father is white collar	-0.00304	0.0221	0.0813**	0.123**	-0.00139	0.0238	0.0688*	0.119**
	(0.0147)	(0.0184)	(0.0332)	(0.0518)	(0.0147)	(0.0183)	(0.0366)	(0.0499)
Observations	4,672	4,672	3,595	1,729	4,672	4,672	3,595	1,728
R-squared	0.151	0.182	0.471	0.388	0.150	0.190	0.378	0.388
Mean Dep. Var.	0.712	0.323	0.00544	0.000785	0.712	0.323	0.00522	-0.000960

Notes: (1) The table displays the estimation of the effect of early test scores on grade 9 and 12 test scores and enrollment by subject and grade. (2) Specifications for each subject and grade include as independent variables grade 6 test scores of the same subject. (3) Sample: Subsample of the ENLACE panel that has grade 6 students and parents surveys. (4) All specifications include school fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2: OLS – ENLACE mathematics and Spanish test scores and later outcomes

VARIABLES	(1) College Student	(2) Employed	(3) ln hourly wage	(4) Formal firm	(5) College Student	(6) Employed	(7) ln hourly wage	(8) Formal firm
Enlace Spanish	0.0885***	-0.0285	0.0619**	-0.00724				
	(0.0149)	(0.0280)	(0.0266)	(0.0264)				
Enlace mathematics					0.0749***	0.0132	0.0474*	0.00573
					(0.0129)	(0.0249)	(0.0277)	(0.0267)
Upper Secondary GPA	0.0763***	0.0442*	-0.000549	0.00642	0.0733***	0.0370	-0.00313	0.00312
	(0.0146)	(0.0228)	(0.0260)	(0.0242)	(0.0145)	(0.0233)	(0.0271)	(0.0259)
Girl	-0.0751***	-0.233***	-0.0439	0.0116	-0.0362	-0.232***	-0.0222	0.0108
	(0.0262)	(0.0441)	(0.0497)	(0.0474)	(0.0266)	(0.0450)	(0.0516)	(0.0492)
Private Upper Secondary	0.111***	-0.0974	0.0553	-0.0842	0.115***	-0.0957	0.0626	-0.0833
	(0.0319)	(0.0644)	(0.0729)	(0.0655)	(0.0323)	(0.0648)	(0.0751)	(0.0654)
Urban resident	0.276***	0.0398	0.0970*	0.138**	0.272***	0.0338	0.0952*	0.136**
	(0.0373)	(0.0474)	(0.0533)	(0.0567)	(0.0381)	(0.0470)	(0.0544)	(0.0566)
Observations	3,705	1,162	1,020	1,020	3,705	1,162	1,020	1,020
R-squared	0.168	0.149	0.177	0.098	0.165	0.148	0.174	0.098
Birth Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth State Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	1778	822	706	706	1778	822	706	706
Mean Dep. Var.	0.630	0.578	2.821	0.396	0.630	0.578	2.821	0.396

Notes: (1) The table displays the estimation of the effect of Spanish and math test scores on labor market outcomes. (2) All specifications include controls for gender, upper secondary GPA, private school, age and State fixed effects. (3) Sample: ENILEMS-ENLACE dataset. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3: OLS – ENLACE achievement levels and secondary school outcomes

	(1)	(2)	(3)	(4)
	Enrollment		Score	
VARIABLES	Grade 9	Grade 12	Grade 9	Grade 12
A. Spanish Score				
Elementary level	0.133***	0.150***	0.682***	0.707***
	(0.0213)	(0.0189)	(0.0453)	(0.0978)
Good level	0.184***	0.257***	1.552***	1.443***
	(0.0238)	(0.0244)	(0.0526)	(0.104)
Excellent level	0.241***	0.340***	2.018***	1.882***
	(0.0307)	(0.0425)	(0.0810)	(0.126)
Girl	0.0399***	0.0422***	0.164***	0.154***
	(0.0120)	(0.0138)	(0.0272)	(0.0437)
Mother has lower secondary	0.0576***	0.0765***	0.130***	0.189***
	(0.0151)	(0.0172)	(0.0342)	(0.0536)
Father has lower secondary	0.0385**	0.0437**	0.0638*	-0.0402
	(0.0157)	(0.0175)	(0.0351)	(0.0546)
Mother is white collar	0.00643	0.00811	0.0489	-0.0656
	(0.0181)	(0.0236)	(0.0448)	(0.0677)
Father is white collar	0.00150	0.0272	0.105***	0.130**
	(0.0148)	(0.0186)	(0.0348)	(0.0538)
Observations	4,672	4,672	3,595	1,729
R-squared	0.145	0.166	0.418	0.345
Mean Dep. Var.	0.760	0.368	0.0625	0.0508
B. Mathematics Score				
Elementary level	0.128***	0.147***	0.610***	0.423***
	(0.0197)	(0.0174)	(0.0445)	(0.0837)
Good level	0.212***	0.340***	1.345***	1.129***
	(0.0224)	(0.0238)	(0.0535)	(0.0907)
Excellent level	0.244***	0.326***	1.774***	1.684***
	(0.0306)	(0.0389)	(0.0830)	(0.119)
Girl	0.0476***	0.0535***	0.0443	-0.325***
	(0.0120)	(0.0135)	(0.0283)	(0.0433)
Mother has lower secondary	0.0546***	0.0710***	0.0861**	0.0925*
	(0.0150)	(0.0171)	(0.0352)	(0.0534)
Father has lower secondary	0.0368**	0.0397**	0.0205	0.0307
	(0.0156)	(0.0173)	(0.0360)	(0.0559)
Mother is white collar	0.00825	0.0138	0.0129	-0.0130
	(0.0179)	(0.0232)	(0.0456)	(0.0607)
Father is white collar	0.00113	0.0270	0.0772**	0.142***
	(0.0146)	(0.0184)	(0.0373)	(0.0509)
Observations	4,672	4,672	3,595	1,728
R-squared	0.150	0.182	0.339	0.356
Mean Dep. Var.	0.760	0.368	0.0497	0.0716

Notes: (1) The table displays the results of the effect of grade 6 test score levels on grades 9 and 12 enrollment and test scores by subject. (2) The specification includes parents education and job as independent variables. (3) Sample: Subsample of the ENLACE panel that has grade 6 students and parents surveys. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: OLS – ENLACE achievement levels and later outcomes

VARIABLES	(1) College Student	(2) Employed	(3) ln Hourly wage	(4) Formal firm
A. Spanish Score				
Elementary level	0.0536	0.0188	0.0678	0.0514
	(0.0435)	(0.0605)	(0.0662)	(0.0653)
Good level	0.159***	0.00197	0.156**	0.0349
	(0.0433)	(0.0660)	(0.0712)	(0.0653)
Excellent level	0.256***	-0.166	0.184*	0.0353
	(0.0570)	(0.148)	(0.104)	(0.110)
Upper Secondary GPA	0.0799***	0.0466**	0.000240	0.00549
	(0.0142)	(0.0227)	(0.0259)	(0.0239)
Girl	-0.0733***	-0.239***	-0.0440	0.00929
	(0.0263)	(0.0432)	(0.0501)	(0.0473)
Private Upper Secondary	0.116***	-0.0933	0.0613	-0.0816
	(0.0318)	(0.0636)	(0.0724)	(0.0643)
Urban resident	0.277***	0.0396	0.0946*	0.138**
	(0.0373)	(0.0473)	(0.0543)	(0.0566)
R-squared	0.165	0.151	0.178	0.098
B. Mathematics Score				
Elementary level	0.124***	0.0609	0.0668	0.0116
	(0.0294)	(0.0489)	(0.0548)	(0.0522)
Good level	0.205***	-0.0572	0.200**	-0.0361
	(0.0385)	(0.0893)	(0.0799)	(0.0798)
Excellent level	0.218***	-0.0527	-0.158	0.221*
	(0.0471)	(0.178)	(0.0973)	(0.121)
Upper Secondary GPA	0.0748***	0.0405*	-0.00322	0.00424
	(0.0142)	(0.0228)	(0.0273)	(0.0255)
Girl	-0.0359	-0.236***	-0.0222	0.0121
	(0.0265)	(0.0436)	(0.0514)	(0.0490)
Private Upper Secondary	0.117***	-0.0990	0.0647	-0.0831
	(0.0326)	(0.0646)	(0.0756)	(0.0654)
Urban resident	0.277***	0.0338	0.103*	0.132**
	(0.0377)	(0.0469)	(0.0545)	(0.0576)
R-squared	0.169	0.152	0.183	0.102
Observations	3,705	1,162	1,020	1,020
Birth Year Dummies	Yes	Yes	Yes	Yes
Birth State Dummies	Yes	Yes	Yes	Yes
Clusters	1778	822	706	706
Mean Dep. Var.	0.630	0.578	2.821	0.396

Notes: (1) The table displays the results of the effect of ENLACE test score level on subsequent labor market outcomes by subject. (2) The specification includes GPA, gender and private school dummies as independent variables. (3) Sample: ENILEMS-ENLACE panel. *** p<0.01, ** p<0.05, * p<0.1.