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Skills and selection into teaching: Evidence from Latin America

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This paper documents a novel stylized fact: many teachers in Latin America have very low levels of cognitive skills. This skills deficit is the result of both low levels of competencies among the population and a gap between the average skill level of teachers and the rest of the tertiary-educated population (i.e., a teacher skills gap). Furthermore, we observe that individuals with a teaching degree have lower average skills than individuals with other tertiary degrees, and that this gap is larger than the teacher skills gap. This difference is mainly explained by the selection into teaching of graduates from non-teaching degrees. Finally, we show that even controlling for cognitive skills, teachers have lower monthly wages than other professionals, and provide direct evidence that this gap is increasing in skills.

KEYWORDS

teacher quality, teacher salaries, teacher labor markets, Latin America

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Habilidades y selección a la docencia en América Latina

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Este estudio presenta evidencia novedosa sobre el perfil de habilidades de los docentes en cuatro países de América Latina, a partir del análisis de datos provenientes de una encuesta internacional sobre habilidades de la población adulta. Los hallazgos muestran que una amplia proporción de los docentes en la región tienen niveles muy bajos de habilidades cognitivas. Este déficit de habilidades se explica tanto por los bajos niveles de competencias entre la población adulta de estos países, como por la brecha de habilidades existente entre los docentes y el resto de la población con estudios superiores. Asimismo, se documenta que las personas con estudios superiores en el ámbito de la educación tienen en promedio menos habilidades que los graduados de otros campos de estudio y que esta diferencia es mayor a la brecha de habilidades entre docentes y otros profesionistas. Esto se explica por la selección a la docencia de personas con estudios superiores en ámbitos distintos a la educación. Finalmente, se muestra que, incluso controlando por habilidades cognitivas, los docentes tienen en promedio salarios mensuales menores que el resto de los profesionistas. De manera importante, esta brecha salarial es mayor entre los individuos con mayores niveles de habilidades cognitivas.

KEYWORDS

calidad docente, salarios docentes, mercados laborales docentes, América Latina

1 | INTRODUCTION

Teachers are a key determinant of student learning, and the impact of being assigned to a highly effective teacher persists into adult life (Rivkin et al., 2005; Chetty et al., 2014). It is therefore unsurprising that concerns about the low levels of student learning affecting many developing countries overlap with concerns about the capacity of those countries' education systems to attract, select, and retain high-quality teachers and to effectively train and motivate teachers.

Although the identification of high-quality teachers remains somewhat elusive, there is some agreement on the idea that individuals with higher general skills can be better teachers.[1] Several papers have shown that teacher general skills are indeed connected to student learning (Rockoff et al., 2011; Gronqvist and Vlachos, 2016; Hanushek et al., 2019).[2] Motivated by such findings, a string of papers has documented a secular decline in the skills profile of the teaching force in developed countries (Nickell and Quintini, 2002; Corcoran et al., 2004; Fredriksson and Öckert, 2008). There is no comparable evidence for developing countries on the skills of teachers or their evolution, mainly because of the absence of representative data on general skills and occupational status for the adult population.

In this paper, we use a recently released dataset from an international survey on adults' skills with information on four Latin American countries and ask ourselves: what levels of cognitive skills do teachers have in these countries and where do they lie in the skills distribution of tertiary-educated individuals? We then turn our attention to a set of selection patterns into the teaching profession that shape the skills profile of current teachers. Finally, we examine one feature of the labor market that can influence the selection by skills into teaching: how wages vary with skills.

Latin America is a middle-income region formed by countries with low levels of student learning with respect to their national income and education expenditure as a share of GDP (Izquierdo et al., 2018). To say that the region performs below expectations is an understatement. In the words of Hanushek and Woessmann (2012): "The performance of Latin American countries on the worldwide student achievement tests has been truly dismal." Using an instrumental variables approach to deal with the endogeneity of educational achievement, these authors argue that the low levels of cognitive skills in the region can explain why economic growth in Latin America lagged behind the rest of the World during the second half of the twentieth century.

We focus our analysis on Chile, Ecuador, Mexico, and Peru, the four Latin American countries that participated in the Programme for the International Assessment of Adult Competencies (PIAAC) from the Organisation for Economic Co-operation and Development (OECD).[3] The PIAAC survey assesses literacy and numeracy skills on nationally representative samples of the adult population, in addition to collecting detailed occupation and schooling information. Using this information, we identify and center our analysis on preschool and K-12 teachers. As a benchmark, we also study 17 OECD countries with high performance in the Programme for International Student Assessment (PISA)—another

[1] The variance of teacher effectiveness (i.e., value-added to student achievement) is large and weakly correlated to characteristics that are easy to observe, except for the first years of teaching experience (Hanushek and Rivkin, 2006; Rockoff et al., 2011).

[2] A related strand of papers uses data from developing countries to show that teacher subject knowledge shapes student learning. See Metzler and Woessmann (2012) on Peru, Bau and Das (2020) on Pakistan, and Bietenbeck et al. (2017) on 13 countries in sub-Saharan Africa.

[3] These four countries account for approximately one third of the population in Latin America. They are generally representative in terms of economic development, as they span most of the regional distribution of GDP per capita, with the exception of Bolivia and the low income countries in Central America.

OECD survey, which assesses the skills of 15-year-old students.[4]

Our main findings show that Latin America faces a teacher skills deficit. About half of the teachers in the region score at the lowest two proficiency levels (out of six) in the numeracy and literacy domains of the PIAAC survey. This implies, for example, that they have difficulty understanding basic statistics and comparing two pieces of information from a text. The teacher skills deficit is the result of both low levels of competencies among the population in these countries and a gap between the average skills of teachers and the rest of the tertiary-educated population (i.e., a teacher skills gap). Teachers in the region have numeracy and literacy scores that are on average 0.13 and 0.11 standard deviation (SDs), respectively, lower than other individuals with a tertiary education. Furthermore, teachers are 7 percentage points more likely than non-teachers to have a numeracy or literacy score in the two lowest proficiency levels. Both results are statistically significant at the 1 percent level.[5] Overall, we do not find a similar pattern when we look at the high-performing OECD countries.

As obtaining a teaching degree is the main path to a teaching career, it seems natural to ask how the teacher skills gap maps to the skills profile of education graduates vis-à-vis other tertiary graduates. As one could expect, we observe that teaching degree graduates tend to have lower levels of skills than other tertiary graduates. A less obvious finding is that this gap is larger than the teacher skills gap. In Latin America, individuals with a teaching degree have numeracy and literacy scores that are on average 0.28 and 0.21 SDs, respectively, lower than individuals with other tertiary degrees. Furthermore, teaching-degree graduates are 10 and 9 percentage points, respectively, more likely than other tertiary graduates to have a numeracy and literacy score in the two lowest proficiency levels, and 1 and 2 percentage points, respectively, less likely to have a score in the top two proficiency levels. All of these results are statistically significant at the 5 percent level.

We show that most of the difference between the teacher skills gap and the education graduates skills gap is accounted for by the selection of non-education graduates into teaching. Teachers with non-teaching degrees have higher numeracy and literacy scores on average than teachers with a teaching degree, by 23 and 19 percent of a SD, respectively. This is not an obvious result even if non-education graduates have higher average skills than education graduates because it depends on how teachers are selected from the pool of individuals with non-education degrees. When we investigate this selection process, we find that non-education graduates who work as teachers have the same skills, on average, than those who work in other professions. We also find suggestive evidence of another selection pattern: teaching-degree graduates who become and remain teachers tend to have higher levels of skills than those who are not teachers. The first group has average numeracy scores that are 14 percent of a SD higher, although we do not observe differences in literacy scores.

Several studies have documented that Latin American teachers tend to have lower monthly wages than tertiary-educated individuals working in other occupations, which potentially discourages highly skilled individuals from joining the teaching profession (Bruns and Luque, 2014; Mizala and Ñopo, 2016; Elacqua et al., 2018). As such gaps are generally estimated using ordinary least squares regressions in which researchers control for the observable characteristics available in labor force surveys (typically gender, age, and schooling), it is not clear whether these differences still hold after taking into account the teacher skills gap. We take advantage of the availability of data on wages and cognitive skills in PIAAC and show that even when controlling for skills, teachers tend to have lower

[4] Indonesia, Kazakhstan, Turkey, and seven Eastern European countries also took part in the PIAAC survey.
[5] Because of sample size restrictions, we do not present estimates at the country level.

monthly wages than other tertiary graduates.[6] Including numeracy and literacy scores in the wage equation changes the estimate of the teacher wage gap from 18 to 14 percent. Furthermore, we find a weaker relationship between wages and skills in the teacher labor market than in the market for other tertiary graduates. In other words, the teacher wage gap in Latin America is increasing in skills.

Because of data limitations, there is little evidence from developing countries on the cognitive skills that teachers have and their position in the skills distribution. To circumvent this obstacle, a few studies have documented the skills gap between students enrolled in education programs and those enrolled in other tertiary degrees (for Latin America see Neilson et al. (2019) on Chile, Elacqua et al. (2018) on Colombia and Chile, and de Hoyos, Estrada and Vargas (2018) on Mexico and Ortega (2010) on Venezuela).[7] However, as we show in this paper, the skills distribution of education students does not necessarily reflect the skills distribution of teachers. Our first contribution is, hence, to provide novel evidence on an understudied topic of high policy relevance: the skills profile of teachers in Latin America.[8] Furthermore, to understand better the determinants of the teacher skills gap, we characterize four selection processes that define the stock of teachers. Finally, our last contribution is to provide novel evidence on the relationship between the teacher wage gap and cognitive skills. Our findings back up a long-held belief in developing countries: the teacher wage gap is increasing in skills.

The findings presented here have clear policy implications. Many teachers in Latin America do not have the minimum level of cognitive competencies to do their job. This skills deficit is even larger among graduates from education degrees. So, the screening mechanisms that determine the access to teacher colleges (Neilson et al., 2019) and teaching jobs (Estrada, 2019) deserve a high level of attention. Recruiting individuals with non-teaching degrees is useful to improve the pool of teachers in terms of cognitive skills, although they might need to acquire specific teaching skills to be effective teachers. Finally, policies directed at making teacher wages—and more generally progress in the teaching career—less dependent on seniority and more dependent on performance and skills are worth exploring.

The rest of the paper is organized as follows: Section 2 discusses the main features of teacher labor markets in Latin America, Section 3 describes the data, Section 4 presents and discusses the results on skills and selection into teaching, while Section 5 focuses on the relationship between teacher wages and skills. Section 6 concludes.

2 | TEACHER LABOR MARKETS

The current stock of teachers is the result of different selection patterns determining who joins and stays in the teaching profession. The institutional features of teacher labor markets play an important role in determining which types of individuals self-select into teaching, pass the screening process, and remain in the profession (Jackson et al., 2014). These features also affect the skill accumulation process toward and during the teaching career. Some of these features include the mechanisms for attracting and admitting applicants into initial teacher education programs and teaching jobs, the compensation scheme and professional development of teachers throughout their career, and the rules for firing and/or training

[6] Though, the teacher hourly wage gap is positive.

[7] Neilson, Gallegos and Calle (2019) use long-term data to show that the skill profile of entrants to teacher colleges in Chile has followed a secular decline, which mimics the pattern found in developed countries.

[8] In related work, Bold et al. (2017) document teacher subject knowledge in seven countries in sub-Saharan Africa and find that a large share of primary school teachers in those countries does not have the "minimum knowledge to teach."

ineffective teachers. We focus mainly on the institutional features of public school teaching jobs, as the vast majority of teachers in Latin America work in publicly funded schools.[9]

Studying to become a teacher. A few studies have documented a negative selection into teaching degrees in terms of skills in Latin America (see Neilson, Gallegos and Calle (2019) on Chile, Elacqua et al. (2018) on Colombia and Chile, de Hoyos, Estrada and Vargas (2018) on Mexico, and Ortega (2010) on Venezuela). This is problematic because teaching degrees are the main pathway to a career in teaching. As seen in Appendix Table A.1, 71 percent of teachers in our sample of Latin American countries have a teaching degree granted by a university or teacher training institution.

The choice of pursuing a teaching degree will likely depend on the prestige, potential earnings, and professional development expected throughout a career in teaching as opposed to alternative professions. Teaching jobs in Latin America have low prestige, are on average poorly paid in comparison to other jobs with similar education requirements, and have salary schedules that are flat and mostly linked to seniority (Bruns and Luque, 2014; Mizala and Ñopo, 2016; Elacqua et al., 2018).[10] However, several countries in the region have recently improved the working conditions of teachers, increased teacher salaries, and partly linked payment and career progression to performance. Selection into a teaching degree also depends on the financial support offered to students. Successful education systems such as those in Finland, Singapore, and Sweden offer top secondary students who pursue a teaching career free tuition and salary stipends while they are in training (Bruns and Luque, 2014), and several countries in Latin America offer merit-based scholarships and/or stipends to teaching students (Elacqua et al., 2018).

The admission policies in universities and teacher training institutions also shape the pool of potential teachers. Unlike many successful education systems, teaching degrees in Latin America do not have strict admission requirements (Elacqua et al., 2018). That said, prospective teaching students in Chile were recently required to score above a threshold in the national university entrance examination, thereby improving the selection into teaching degrees (Neilson et al., 2019). Although Ecuador and Peru implemented similar policies, they were discontinued shortly thereafter. Prospective teachers enter higher education institutions with a certain set of skills, and these skills are further molded during this educational experience. Although there is little research on the quality of teacher education in Latin America, there is some evidence that teachers acquire fewer skills during tertiary education than students from other disciplines (Balcázar and Ñopo, 2016).

Hiring for teaching positions. How education systems attract and select teachers is probably the most important process shaping the stock of teachers. The lack of selectivity in teacher education in Latin America has led to an excess supply of potential teachers (Bruns and Luque, 2014). The pool of candidates for teaching positions is even larger, as individuals who hold a non-teaching degree can also apply for teaching jobs, although with some restrictions. Appendix Table A.1 shows that 29 percent of tertiary-educated teachers in Latin America have a non-teaching degree.[11] Given the excess supply of teachers, and the low quality of education granted by many teacher training institutions, adequately screening applicants for teaching jobs is crucial. As teachers in public schools are civil servants with job tenure, hiring mistakes are difficult to reverse. Candidates for teaching positions are

[9] In 2013, for example, over 85 percent of the region's students enrolled in basic education attended public schools (Bruns and Luque, 2014).

[10] Highly compressed and seniority-dependent teacher wages might lead to heterogeneous wage premiums by tenure and skill levels. For example, using a regression discontinuity design, Saavedra et al. (2017) find that novice public school teachers in Colombia have around 65 percent higher annual earnings during their first three years of teaching than applicants who marginally missed the hiring cutoff.

[11] The self-selection into this alternative pathway to teaching is also shaped by the expected prestige, earnings, and professional development in teaching jobs (Ganimian et al., 2017).

typically screened on academic credentials and work experience (Elacqua et al., 2018), even though these characteristics are weakly related to effectiveness in teaching (Hanushek and Rivkin, 2010; Rockoff et al., 2011). Opacity over the availability of specific vacancies and wide discretion by education officials over the selection of applicants was considered the norm in most countries. Although it is difficult to identify an effective teacher at the point of entry, there is evidence that teacher effectiveness is related to teachers' cognitive skills (Jacob et al., 2018; Hanushek et al., 2019). Over the last decade, several Latin American countries have started to implement merit-based competitions to recruit new teachers using competency tests (for example Colombia, Ecuador, Mexico, and Peru). Estrada (2019) finds that the implementation of this procedure to hire teachers in Mexico led to higher student learning.

Continuing in the teaching profession. Since teaching skills are also acquired during the first years on the job (Hanushek and Rivkin, 2010), screening at the point of entry into the teaching career is necessary but not sufficient. Although most OECD countries have probationary periods for novice teachers, these are rare in Latin America (Bruns and Luque, 2014).[12] Removing low-performing teachers later in their career is even harder, as most teachers work in the public sector and cannot be easily fired. It should be noted, however, that a growing number of Latin American countries are reforming their education systems to limit the job security of poorly performing teachers (Bruns and Luque, 2014). In addition to the mechanisms for firing low-performing teachers, the skill composition of the teacher pool is also determined by which teachers decide to leave the profession (or stay). Working conditions, pay, and opportunities for professional development will likely have an impact on teacher attrition, particularly in the case of high-skilled teachers who may have more attractive outside options. Selection is not the only channel that shapes the skills profile of teachers. Throughout their careers, teachers can acquire skills through work experience and training. Although there is evidence that teachers acquire teaching-specific skills during their first few years of experience (Hanushek and Rivkin, 2010), and participate frequently in in-service training (Popova et al., 2018), there is no evidence on whether they accumulate more or fewer cognitive skills than other professionals.

3 | DATA

3.1 | The PIAAC Survey

We rely on data from the first cycle of the Survey of Adult Skills, which was conducted in 39 countries between 2011 and 2018 as part of PIAAC. This survey measures adults' skills across various dimensions and collects detailed background information on their education and employment history, among other characteristics. A nationally representative sample of individuals ages 16 to 65 is selected in each country, with a minimum sample size of around 5,000 respondents (OECD, 2016). The interviews are conducted by trained enumerators in the respondents' homes.

Respondents are assessed on their proficiency in literacy and numeracy. Literacy is the ability to understand and use information from written texts in a variety of contexts to achieve goals and develop knowledge and potential, while numeracy is the ability to use, apply, interpret, and communicate mathematical information and ideas.[13] PIAAC provides

[12] Some countries in the region have nominal probationary periods, after which most teachers are automatically hired (Elacqua et al., 2018).

[13] The assessments are meant to be computer based, although respondents with insufficient experience with computers are allowed to take a paper-based test. Although PIAAC also has an assessment of problem-solving skills, we focus only on numeracy and literacy skills because respondents who take the paper-based

a snapshot of respondents' numeracy and literacy skills at the moment of the survey. One should take into account, however, that cognitive skills are malleable, and the level of skills possessed at a point in time is the product of the acquisition or depreciation of skills through early childhood experiences, schooling, higher education, and labor market experiences (Behrman et al., 2014).

3.2 | Sample

Our sample includes the four Latin American countries that participated in PIAAC: Chile, Ecuador, Mexico, and Peru. As a benchmark, our sample also includes the 17 OECD countries with average math and reading PISA scores above the OECD mean in 2015. These are Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Ireland, Japan, the Netherlands, New Zealand, Norway, Poland, Slovenia, Korea, Sweden, and the United Kingdom. We drop individuals with missing literacy or numeracy scores (1 percent of respondents).

We identify teachers using ISCO occupation codes at the four-digit level (and three-digit when information is available at only this level).[14] We use the current occupation for employed individuals and the last occupation for individuals currently not employed (87 percent of teachers are identified using their current occupation and 13 percent are identified using their last occupation). We drop employed respondents whose occupation is missing (1.3 percent of the sample). Since our main focus is preschool and K-12 teachers, we exclude university professors and other teachers at tertiary-level institutions.

In our main analysis, we compare teachers to non-teachers with similar educational attainment. The majority of the teachers in the sample (87 percent) have a tertiary degree, and so we restrict our sample to tertiary-educated individuals. We further limit our sample to individuals ages 22 and above (98.7 percent of tertiary-educated individuals). This sample has 50,092 observations, of which 10 percent are teachers. Summary statistics for this sample are presented in Panel A of Table 1. When comparing the wages of teachers and non-teachers, we further restrict our sample to wage earners. This excludes self-employed workers, and persons who are unemployed or out of the labor force (30 percent of our previous sample). We also exclude individuals with missing monthly wages (4 percent of wage earners), persons who work less than 20 hours a week, and those in the top and bottom 1 percent of each country's wage distribution. The sample of wage earners has 31,109 observations, of which 12 percent are teachers. Panel B of Table 1 describes the main characteristics of this sample.

4 | SKILLS AND SELECTION INTO TEACHING

4.1 | What Skills Do Teachers Have?

Panel A in Figure 1 shows the density of numeracy scores of tertiary-educated individuals in Latin America by occupation status (teachers and non-teachers).[15] Mere visual inspection indicates that Latin American teachers tend to have low levels of cognitive skills as measured by the PIAAC survey. Teachers in this region have an average numeracy score of 231. For comparison, keep in mind that PIAAC scores are standardized at the international level with a mean of 250 and a SD of 50. That is, even when they are a highly selected group

test do not take the problem-solving assessment.

[14] Finland, Germany, and Norway use only three-digit occupation codes.

[15] Throughout the paper we use the first plausible value of numeracy and literacy scores, following Hanushek et al. (2015), Falck et al. (2016), and Grundke et al. (2018).

in terms of schooling, Latin American teachers have numeracy scores that are on average 38 percent of a SD lower than the international mean, which includes individuals of all schooling levels. Furthermore, a large share of teachers in Latin America is below basic levels of proficiency. More precisely, 15 percent are below level 1 in the PIAAC proficiency scale, and 52 percent are in level 1 or below (see the areas to the left of the vertical lines). Individuals below proficiency level 1 can most of the time carry out simple processes such as counting, sorting, and performing basic arithmetic operations with whole numbers or money but face difficulties understanding simple percentages such as 50 percent. Individuals in proficiency level 1 can mostly understand simple percentages such as 50 percent and perform tasks that require a one-step process, but face difficulties in tasks that require a two-step process involving calculations with whole numbers and common decimals, percentages, and fractions. They also face difficulties understanding basic data and statistics in texts, tables, and graphs (see more about the PIAAC proficiency levels in OECD (2016)). Summing up, the evidence presented here suggests that at least half of the teachers in Latin America do not have enough skills to effectively perform their job.

The teacher skills deficit can be thought of as the result of 1) the low level of skills among the population of potential teachers and 2) the skills gap between teachers and the rest of the tertiary-educated population. Figure 1 is a useful starting point to learn about these patterns, as it shows that individuals in Latin America with a tertiary degree in other professions tend to have lower numeracy scores than the international mean, but they have higher average scores than teachers.

We elaborate on the differences in PIAAC scores between teachers and non-teachers in Table 2, where we report the results from regressing numeracy and literacy scores on an indicator for whether the respondent works as a teacher and on country fixed effects. The numeracy and literacy scores of teachers in Latin America are 6.3 and 5.3 points lower, respectively, on average than those of tertiary-educated individuals in other professions. These differences are statistically significant at the 1 percent level. This skills gap is equivalent to 12 percent of a SD in numeracy and 11 percent in literacy. Furthermore, teachers are 7 percentage points more likely than non-teachers to have a numeracy and literacy score in proficiency level 1 or below ("Low Score"). In contrast, there is no clear gap in the probability of having a score in proficiency level 4 or above ("High Score"). The coefficients of interest for both numeracy and literacy scores have a negative sign, but only the latter is statistically significant.

Overall, we do not find a similar pattern when we look at the OECD countries. Teachers have lower numeracy scores than non-teachers on average (-0.12 points, although this difference is not statistically significant), but have higher literacy scores (3.8 points, statistically significant at the 1 percent level). Interestingly, teachers are 2–3 percentage points less likely to have low scores in numeracy and literacy skills, but are also less likely to have a high score, particularly in numeracy (by around 4 percentage points). In other words, in these OECD countries, the distribution of PIAAC scores is slightly more compressed among teachers than among non-teachers.

Summing up, we document that a large share of teachers in Latin America have low levels of cognitive skills (i.e., a skills deficit) and that teachers tend to have lower levels of skills than individuals with similar schooling levels (i.e., a teacher skills gap). In contrast, we do not observe such a pattern when we analyze high-performing OECD countries.

4.2 | What Selection Patterns Could Explain the Teacher Skills Gap?

What are the skills of those who study teaching? As obtaining a teaching degree is the main path to a teaching career (Section 2), it seems natural to ask if there is a skills gap

between the individuals who pursue a teaching degree and those who pursue another tertiary degree. With this purpose in mind, Figure 2 plots the density of numeracy scores for both groups (see the figure to the left for Latin America and the one in the right for the OECD). Visual inspection suggests that there is a large skills gap in Latin America, which we confirm in Table 3 with regression estimates. Individuals in Latin America with a teaching degree have numeracy and literacy scores that are 14.1 and 10.5 points lower on average than individuals with other tertiary degrees–or 28 and 21 percent of a SD. Furthermore, teaching graduates are 10 and 9 percentage points more likely, respectively, to have a low score in literacy and numeracy and 2 and 1 percent less likely, respectively, to have a high score in literacy and numeracy. Most of these results are statistically significant at the 1 percent level. These findings are consistent with those from Neilson et al. (2019) on Chile; Elacqua et al. (2018) on Colombia and Chile; de Hoyos, Estrada and Vargas (2018) on Mexico; and Ortega (2010) on Venezuela. These studies document that compared to university students enrolled in other majors, students enrolled in education majors have lower numeracy and literacy scores on average in the national standardized exams that students take at the end of secondary school.

In the OECD countries, teaching graduates also have lower average numeracy and literary scores than other tertiary graduates (by 7.3 and 2.5 points, respectively) and are less likely to have a high score in both domains (by 8 and 4 percentage points, respectively). We do not observe a difference on the probability of having low scores in numeracy and literacy (although the estimates for literacy are statistically significant, the point estimates are very small).

The skills gap in Latin America between teaching graduates and other tertiary graduates seems larger than the gap between actual teachers and non-teachers with tertiary studies. This suggests that there might be some selection patterns in the education system that mitigate the negative selection in terms of skills into obtaining a teaching degree. Part of this gap could also be explained by the lower accumulation of cognitive skills in teaching degrees compared to other tertiary degrees (Balcázar and Ñopo, 2016).

What are the skills of those who study teaching and become teachers? Figure 3 plots the density of numeracy scores of teaching graduates by whether they work as teachers or not. The visual evidence indicates that teaching graduates who enter and stay in the teaching profession have higher average numeracy scores than those who do not. The results in Table 4 confirm this for numeracy scores, but not for literacy. In particular, teachers with a teaching degree have average numeracy scores that are almost 7 points (0.14 SD) higher than non-teachers with a teaching degree. Although teachers have higher average literacy scores (2.5 points), this difference is not statistically significant.

The positive selection into working as a teacher is stronger in the OECD countries. Among teaching degree graduates, individuals with a teaching occupation tend to perform better in the numeracy and literacy domains than non-teachers. This pattern is evident in the bottom and top of the skills distribution.

In summary, the evidence presented here indicates that among teaching-degree graduates, there is some but not much positive selection on skills into entering and staying in the education system.

Is there a skills gap between teachers who studied teaching and other teachers? A teaching degree is the main pathway to becoming a teacher, but it is not the only one. Around one-third of teachers in our sample of Latin American countries have non-teaching degrees. So, it seems natural to ask if there is a skills gap between these two types of teachers. Figure 4 shows the density of numeracy scores for both groups. Teachers with a teaching degree in Latin America seem to have lower numeracy scores on average than other teachers, while in the OECD countries this seems not to be the case. Table 5 presents

the corresponding regression estimates. Latin American teachers with a teaching degree have substantially lower numeracy and literacy scores than teachers with other degrees, by 11.5 and 9.4 points, or 23 and 19 percent of a SD, respectively. These differences are driven by the lower end of the distribution, as teachers are 10 and 9 percentage points, respectively, more likely to have low numeracy and literacy scores, but do not differ in the probability of having a high score.[16]

The skills profiles of both groups of teachers are less dissimilar in the OECD countries. Teaching degree graduates' numeracy and literacy scores are 3.7 and 2.4 points lower, on average, or 7 and 5 percent of a SD, respectively. Unlike the case of Latin America, these differences are found at the top of the distribution, as teachers with a teaching degree are 4 percentage points less likely to have a high score compared to teachers with other degrees.

The selection of individuals with non-teaching degrees improves the composition of the stock of teachers in Latin America in terms of cognitive skills. This is not an obvious result, even if non-teaching graduates have higher skills on average than teaching graduates, because it depends on how teachers are selected among the pool of individuals with non-teaching degrees.

What are the skills of those who did not study teaching and become teachers? We finally look at where teachers without a teaching degree are located in the skills distribution of non-teaching graduates. Figure 5 and Table 6 show this comparison. The skill distribution of individuals with a non-teaching tertiary degree who work as teachers in Latin America is similar to the one of those who do not work as teachers. That is, we do not find any selection pattern in terms of skills into teaching among those who did not study teaching during their tertiary education. This is not the case in the OECD countries, where the skills distribution of teachers seems more compressed than that of non-teachers, in line with previous results.

5 | SKILLS AND TEACHER WAGES

Is the teacher wage gap explained by the skills gap? Several studies have documented that teachers tend to have lower monthly wages than tertiary-educated individuals working in other occupations (Section 2). This is not necessarily the case, however, if one looks at hourly wages (Estrada, 2019). These low monthly wages might be an important restriction on attracting more talented people to the teaching profession. However, the teacher skills gap documented in the previous section suggests that the teacher wage gap might be explained by differences in skills between teachers and non-teachers.

Figure 6 shows the monthly wage distribution by occupation status (teachers and non-teachers) for the Latin American and high-performing OECD countries. In Latin America, the distribution of teachers' monthly salaries is more compressed than the wage distribution of non-teachers, and a larger part of the mass seems to be located further to the left. This wage compression is consistent with the institutional features that shape teachers' labor market in Latin America (Section 2). In contrast, in the OECD countries the difference in the wage distribution by occupation status is less startling.

Panel A in Table 7 shows the regression estimates of the average gap in monthly wages (in ln) between teachers and non-teachers. Controlling for gender, age, schooling, country fixed effects, the average wages of teachers in Latin America are about 18 percent lower than non-teachers, and about 14 percent lower once we control for numeracy and literacy scores. Both results are statistically significant at the 1 percent level. Hence, the teacher wage gap

[16] As shown in Appendix Table A.1, teachers with a non-teaching degree are more likely to teach in secondary school. If we compare individuals who teach in the same schooling level, the differences are smaller, although the general pattern still holds (see Table A.2 in the Online Appendix).

persists even if one takes cognitive skills—as measured by the PIAAC survey—into account. In contrast, the estimates of the teacher (monthly) wage gap in the OECD countries are not statistically significant.

Panel B reports the estimated gap in hourly wages between teachers and non-teachers. Controlling for baseline characteristics, the average hourly wage of teachers in Latin America is almost 7 percent higher than that of non-teachers (column 1), and 2 percent higher in OECD countries (column 3). Including our measures of skills makes little difference in these results.

Do teachers with more skills have higher wages? Panel A of Table 8 shows the partial correlation between monthly wages and the aggregated PIAAC score for teachers and non-teachers. Controlling for age, gender, schooling, and country fixed effects, the relationship between skills and wages is three times larger for non-teachers compared to teachers in Latin America (see Table 8). We find a similar relationship in the OECD countries. These patterns are similar when examining the relationship between hourly wages and skills (see Table 8). To better illustrate this point, Figure 7 provides the visual counterpart to the full regression model in Panel A of Table 8, and shows how the teacher wage gap in Latin America increases with skills.

6 | CONCLUSIONS

In this paper, we document a novel and worrisome stylized fact: a large share of Latin American teachers have very low levels of cognitive skills. Around half of the teachers in the region score at proficiency level 1 or below in the numeracy and literacy domains of the PIAAC survey. This implies, for example, that they have difficulty in understanding basic statistics and comparing two pieces of information from a text. The teacher skills deficit is the result of both relatively low levels of competencies among the population of these countries and a teacher skills gap, i.e., teachers have lower skills on average than the rest of the tertiary-educated population. Furthermore, in line with previous studies, we observe that individuals who graduate with teaching degrees tend to have lower levels of skills than individuals who graduate with other tertiary degrees, a gap that is larger than the teacher skills gap. We show that two selection patterns explain this difference. First, among individuals with a teaching degree, those who become teachers and stay in teaching have somewhat higher levels of skills than those who end up out of teaching. Second, and more importantly, teachers with non-teaching degrees have higher levels of skills on average than those with teaching degrees.

This skills deficit could hinder the capacity of many Latin American teachers to adequately perform their job. There are many dimensions that make a good teacher, and cognitive skills are only one of them. However, it seems hard to imagine that an education system can steadily improve student learning if many teachers lack basic competencies. The teacher skills deficit is probably both cause and consequence of the learning crisis occurring in Latin American and other developing countries. There has been a lot of attention in policy discussions about the importance of attracting individuals from the top of the skills distribution into teaching. The evidence presented here suggests an alternative pathway: limiting the entry into teaching of individuals with very low levels of competencies. This argument is in line with findings in Neilson, Gallegos and Calle (2019), who use data from Chile to show how a screening policy that limits the access to teacher colleges of students with low levels of achievement in the entrance exam can significantly improve the pool of future teachers in several performance dimensions. The evidence presented here also shows that screening on the basis of having a tertiary degree is not enough, as we find that many

teachers with tertiary education lack the basic competencies to perform their job. Improving how institutions that grant teaching degrees attract, select, and train future teachers seems imperative. Recruiting individuals with non-teaching degrees is useful to improve the pool of teachers in terms of cognitive skills, but they might need to acquire specific teaching skills to be effective teachers. Improving hiring and induction processes or teacher certification programs to guarantee that all teachers have a minimum set of skills seems a promising avenue for policy. Finally, policies directed at making teacher wages less dependent on seniority and more on performance and skills are worth exploring.

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TABLES AND FIGURES

TABLE 1 Summary Statistics

	Mean	SD	Min	Max	N
Panel A: Tertiary educated sample					
Age	42.098	11.910	22.000	65.000	50,092
Female	0.564	0.496	0.000	1.000	50,092
Literacy score	287.632	47.285	36.297	446.448	50,092
Numeracy score	284.643	51.485	0.000	466.984	50,092
Non-bachelor's degree	0.350	0.477	0.000	1.000	50,092
Bachelor's degree	0.406	0.491	0.000	1.000	50,092
Master's degree or more	0.244	0.430	0.000	1.000	50,092
Employed	0.824	0.381	0.000	1.000	50,074
Self-employed	0.117	0.321	0.000	1.000	49,505
Teacher	0.100	0.300	0.000	1.000	50,092
Panel B: Wage earners					
Age	40.878	10.927	22.000	65.000	31,109
Female	0.551	0.497	0.000	1.000	31,109
Literacy score	292.833	45.047	47.083	446.448	31,109
Numeracy score	290.091	49.230	44.162	466.984	31,109
Non-bachelor's degree	0.347	0.476	0.000	1.000	31,109
Bachelor's degree	0.395	0.489	0.000	1.000	31,109
Master's degree or more	0.258	0.437	0.000	1.000	31,109
Employed	1.000	0.000	1.000	1.000	31,109
Self-employed	0.000	0.000	0.000	0.000	31,109
Teacher	0.118	0.323	0.000	1.000	31,109
Monthly wage (USD PPP)	3,519.371	2,018.288	216.617	19,049.344	31,109
Hours per week	40.483	9.248	20.000	125.000	31,109
Wage per hour (USD PPP)	20.259	10.848	0.981	155.987	31,109

Notes: Panel A presents descriptive statistics for the sample of PIAAC respondents of age 22 and above with a tertiary degree in Belgium, Canada, Chile, Denmark, Ecuador, Estonia, Finland, France, Germany, Ireland, Japan, Mexico, the Netherlands, New Zealand, Norway, Peru, Poland, Slovenia, Korea, Sweden, and the United Kingdom. We exclude university professors and other teachers at tertiary-level institutions as well as individuals with missing literacy or numeracy scores. Panel B further restricts the sample to wage earners who work 20 or more hours a week, report their monthly income, and are not in the bottom or top 1 percent in their country's wage distribution.

TABLE 2 PIAAC Scores: Teachers and Non-teachers

	Score		Low score		High score	
	Numeracy	Literacy	Numeracy	Literacy	Numeracy	Literacy
Panel A: Latin America						
Teacher	-6.296***	-5.305***	0.067***	0.072***	-0.006	-0.013***
	(2.079)	(1.947)	(0.022)	(0.022)	(0.006)	(0.005)
Observations	4,511	4,511	4,511	4,511	4,511	4,511
Observations (teachers)	569	569	569	569	569	569
R^2	0.071	0.106	0.053	0.078	0.005	0.010
Dependent variable mean	231.071	235.623	0.443	0.407	0.023	0.022
Panel B: OECD						
Teacher	-0.120	3.783***	-0.025***	-0.028***	-0.042***	0.003
	(0.661)	(0.614)	(0.004)	(0.003)	(0.006)	(0.007)
Observations	45,581	45,581	45,581	45,581	45,581	45,581
Observations (teachers)	4,437	4,437	4,437	4,437	4,437	4,437
R^2	0.050	0.043	0.027	0.020	0.028	0.025
Dependent variable mean	289.945	292.779	0.090	0.069	0.224	0.219

Notes: The sample in Panel A is composed of PIAAC respondents ages 22 and above from Latin America that have a tertiary degree. We exclude university professors and other teachers at tertiary-level institutions. Panel B contains the analogous sample for OECD countries with average math and reading PISA scores above the OECD mean in 2015. This table presents the results of regressions where the independent variables are country fixed effects and a dummy for whether the respondent is a teacher. The dependent variables in columns 1 and 2 are the numeracy and literacy scores, respectively. The dependent variable in columns 3 and 4 is a dummy for whether the respondent scored below proficiency level 2 in numeracy and literacy, respectively. The dependent variable in columns 5 and 6 is a dummy for whether the respondent scored at level 4 or above. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 3 PIAAC Scores: Teaching Degrees and Non-teaching Degrees

	Score		Low score		High score	
	Numeracy	Literacy	Numeracy	Literacy	Numeracy	Literacy
Panel A: Latin America						
Teaching degree	-14.107***	-10.534***	0.105***	0.087***	-0.012**	-0.018***
	(1.804)	(1.632)	(0.019)	(0.019)	(0.005)	(0.004)
Observations	4,511	4,511	4,511	4,511	4,511	4,511
Observations (teaching degree)	798	798	798	798	798	798
R^2	0.081	0.112	0.057	0.080	0.005	0.011
Dependent variable mean	231.071	235.623	0.443	0.407	0.023	0.022
Panel B: OECD						
Teaching degree	-7.277***	-2.482***	0.001	-0.008**	-0.083***	-0.036***
	(0.621)	(0.572)	(0.004)	(0.003)	(0.005)	(0.006)
Observations	45,070	45,070	45,070	45,070	45,070	45,070
Observations (teaching degree)	5,580	5,580	5,580	5,580	5,580	5,580
R^2	0.050	0.040	0.022	0.015	0.031	0.025
Dependent variable mean	289.945	292.779	0.090	0.069	0.224	0.219

Notes: The sample in Panel A is composed of PIAAC respondents ages 22 and above from Latin America that have a tertiary degree. We exclude university professors and other teachers at tertiary-level institutions. Panel B contains the analogous sample for the OECD countries with average math and reading PISA scores above the OECD mean in 2015. This table presents the results of regressions where the independent variables are country fixed effects and a dummy for whether the respondent has a teaching degree. The dependent variables in columns 1 and 2 are the numeracy and literacy scores, respectively. The dependent variable in columns 3 and 4 is a dummy for whether the respondent scored below proficiency level 2 in numeracy and literacy, respectively. The dependent variable in columns 5 and 6 is a dummy for whether the respondent scored at level 4 or above. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 4 PIAAC Scores: Teachers and Non-teachers with Teaching Degrees

	Score		Low score		High score	
	Numeracy	Literacy	Numeracy	Literacy	Numeracy	Literacy
Panel A: Latin America						
Teacher	6.941**	2.456	-0.008	0.033	-0.000	-0.003
	(3.304)	(2.951)	(0.035)	(0.034)	(0.008)	(0.006)
Observations	798	798	798	798	798	798
Observations (teachers)	405	405	405	405	405	405
R^2	0.089	0.103	0.053	0.106	0.004	0.007
Dependent variable mean	218.275	225.589	0.539	0.490	0.013	0.006
Panel B: OECD						
Teacher	8.094***	8.701***	-0.045***	-0.036***	0.026**	0.038***
	(1.186)	(1.090)	(0.008)	(0.007)	(0.010)	(0.011)
Observations	5,580	5,580	5,580	5,580	5,580	5,580
Observations (teachers)	2,732	2,732	2,732	2,732	2,732	2,732
R^2	0.053	0.064	0.023	0.017	0.027	0.039
Dependent variable mean	285.733	291.693	0.084	0.056	0.164	0.192

Notes: The sample in Panel A is composed of PIAAC respondents ages 22 and above from Latin America that have a tertiary teaching degree. We exclude university professors and other teachers at tertiary-level institutions. Panel B contains the analogous sample for the OECD countries with average math and reading PISA scores above the OECD mean in 2015. This table presents the results of regressions where the independent variables are country fixed effects and a dummy for whether the respondent is a teacher. The dependent variables in columns 1 and 2 are the numeracy and literacy scores, respectively. The dependent variable in columns 3 and 4 is a dummy for whether the respondent scored below proficiency level 2 in numeracy and literacy, respectively. The dependent variable in columns 5 and 6 is a dummy for whether the respondent scored at level 4 or above. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 5 PIAAC Scores: Teachers with Teaching Degrees and Non-teaching Degrees

	Score		Low score		High score	
	Numeracy	Literacy	Numeracy	Literacy	Numeracy	Literacy
Panel A: Latin America						
Teaching degree	-11.522**	-9.362**	0.104**	0.087*	-0.018	-0.017
	(4.630)	(4.376)	(0.046)	(0.047)	(0.015)	(0.012)
Observations	569	569	569	569	569	569
Observations (teaching degree)	405	405	405	405	405	405
R^2	0.098	0.109	0.067	0.088	0.011	0.015
Dependent variable mean	223.312	228.630	0.520	0.490	0.016	0.009
Panel B: OECD						
Teaching degree	-3.682***	-2.380*	-0.007	-0.007	-0.042***	-0.039***
	(1.311)	(1.234)	(0.008)	(0.007)	(0.013)	(0.013)
Observations	4,424	4,424	4,424	4,424	4,424	4,424
Observations (teaching degree)	2,732	2,732	2,732	2,732	2,732	2,732
R^2	0.060	0.051	0.018	0.013	0.032	0.035
Dependent variable mean	291.558	296.529	0.062	0.042	0.197	0.223

Notes: The sample in Panel A is composed of PIAAC respondents ages 22 and above from Latin America that have a tertiary degree and are teachers. We exclude university professors and other teachers at tertiary-level institutions. Panel B contains the analogous sample for the OECD countries with average math and reading PISA scores above the OECD mean in 2015. This table presents the results of regressions where the independent variables are country fixed effects and a dummy for whether the respondent has a teaching degree. The dependent variables in columns 1 and 2 are the numeracy and literacy scores, respectively. The dependent variable in columns 3 and 4 is a dummy for whether the respondent scored below proficiency level 2 in numeracy and literacy, respectively. The dependent variable in columns 5 and 6 is a dummy for whether the respondent scored at level 4 or above. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 6 PIAAC Scores: Teachers and Non-teachers with Non-teaching Degrees

	Score		Low score		High score	
	Numeracy	Literacy	Numeracy	Literacy	Numeracy	Literacy
Panel A: Latin America						
Teacher	-1.514	-0.297	0.023	0.021	0.004	-0.004
	(4.037)	(3.995)	(0.039)	(0.040)	(0.013)	(0.011)
Observations	3,713	3,713	3,713	3,713	3,713	3,713
Observations (teachers)	164	164	164	164	164	164
R^2	0.065	0.104	0.049	0.068	0.004	0.010
Dependent variable mean	233.821	237.780	0.422	0.389	0.026	0.026
Panel B: OECD						
Teacher	1.111	4.276***	-0.014**	-0.015***	-0.017*	0.028***
	(1.050)	(0.994)	(0.006)	(0.005)	(0.010)	(0.011)
Observations	39,490	39,490	39,490	39,490	39,490	39,490
Observations (teachers)	1,692	1,692	1,692	1,692	1,692	1,692
R^2	0.051	0.042	0.024	0.017	0.030	0.025
Dependent variable mean	291.703	294.037	0.085	0.064	0.234	0.226

Notes: The sample in Panel A is composed of PIAAC respondents ages 22 and above from Latin America that have a non-teaching tertiary degree. We exclude university professors and other teachers at tertiary-level institutions. Panel B contains the analogous sample for the OECD countries with average math and reading PISA scores above the OECD mean in 2015. This table presents the results of regressions where the independent variables are country fixed effects and a dummy for whether the respondent is a teacher. The dependent variables in columns 1 and 2 are the numeracy and literacy scores, respectively. The dependent variable in columns 3 and 4 is a dummy for whether the respondent scored below proficiency level 2 in numeracy and literacy, respectively. The dependent variable in columns 5 and 6 is a dummy for whether the respondent scored at level 4 or above. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 7 Wages: Teachers and Non-teachers

	Latin America		OECD	
	(1)	(2)	(3)	(4)
Panel A: Monthly wages (in ln)				
Teacher	-0.175***	-0.144***	-0.006	-0.008
	(0.028)	(0.028)	(0.007)	(0.007)
Observations	2,282	2,282	28,827	28,827
R^2	0.314	0.338	0.392	0.439
Panel B: Hourly wages				
Teacher	0.066**	0.095***	0.024***	0.022***
	(0.028)	(0.028)	(0.007)	(0.007)
Observations	2,282	2,282	28,827	28,827
R^2	0.298	0.319	0.429	0.473
Age, gender, and schooling controls	✓	✓	✓	✓
Literacy and numeracy scores		✓		✓

Notes: Panel A presents the results of regressions where the dependent variable is the respondent's monthly wage (in ln). In Panel B, the dependent variable is the respondent's hourly wage. The regressions in columns (1) and (3) include country fixed effects, age, age squared, gender, and dummies for whether the respondent has a bachelor's or master's degree or higher. The regressions in columns (2) and (4) also control for the respondent's numeracy and literacy scores. The regressions in columns 1 and 2 are conducted for the sample of PIAAC respondents from Latin America that are ages 22 and above and have a tertiary education, are wage earners, are currently employed, work 20 or more hours a week, and are not in the bottom or top 1 percent of their country's wage distribution. We exclude university professors and other teachers at tertiary-level institutions. The regressions in columns 3 and 4 are conducted for the analogous sample in the OECD countries with average math and reading PISA scores above the OECD mean in 2015. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 8 Wages and Skills: Teachers and Non-teachers

	Latin America		OECD	
	Teachers	Non-teachers	Teachers	Non-teachers
Panel A: Monthly wages				
Average literacy and numeracy score	0.001**	0.003***	0.001***	0.003***
	(0.001)	(0.000)	(0.000)	(0.000)
Observations	419	1,863	3,267	25,560
R^2	0.335	0.346	0.604	0.435
Panel B: Hourly wages				
Average literacy and numeracy score	0.001*	0.002***	0.001***	0.003***
	(0.001)	(0.000)	(0.000)	(0.000)
Observations	419	1,863	3,267	25,560
R^2	0.290	0.330	0.584	0.474
Age, gender, and education	✓	✓	✓	✓

Notes: Panel A presents the results of regressions where the dependent variable is the respondent's monthly wage (in ln). In Panel B, the dependent variable is the respondent's hourly wage. All regressions include country fixed effects and the variables for which estimates are reported. The regressions in columns 1 and 2 are conducted for the sample of PIAAC respondents from Latin America that are ages 22 and above, have a tertiary degree, are teachers (column 1) or not teachers (column 2), are wage earners, are currently employed, work 20 or more hours a week, and are not in the bottom or top 1 percent of their country's wage distribution. Both regressions exclude university professors and other teachers at tertiary-level institutions. The regressions in columns 3 and 4 are conducted for the analogous samples in the OECD countries with average math and reading PISA scores above the OECD mean in 2015. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

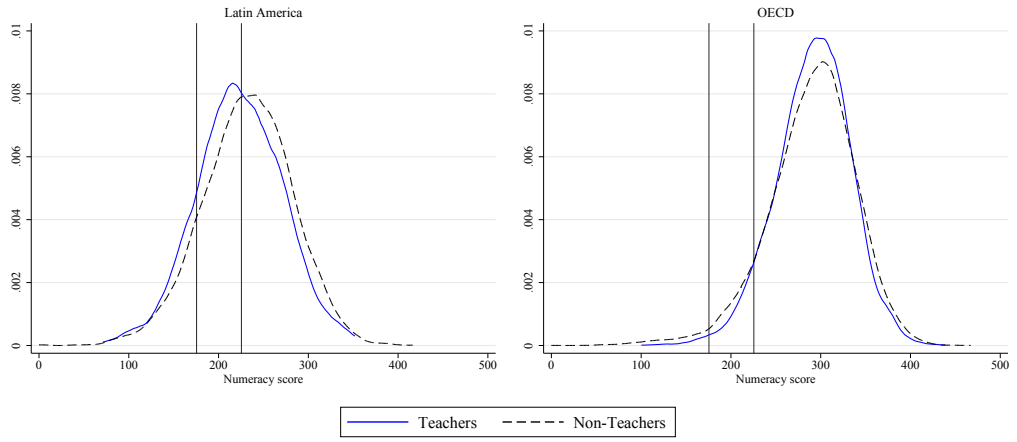

FIGURE 1 Density of Numeracy Scores: Teachers and Non-teachers. *Notes:* These figures depict the kernel density of numeracy scores for both teachers and non-teachers with a tertiary degree. The sample excludes respondents below age 22, university professors, and other teachers at tertiary-level institutions. The first graph plots these densities for respondents from Latin America, whereas the second plots these densities for respondents from OECD-countries with average math and reading PISA scores above the OECD mean in 2015. The vertical lines mark the cutoffs for the proficiency levels below 1 and 1.

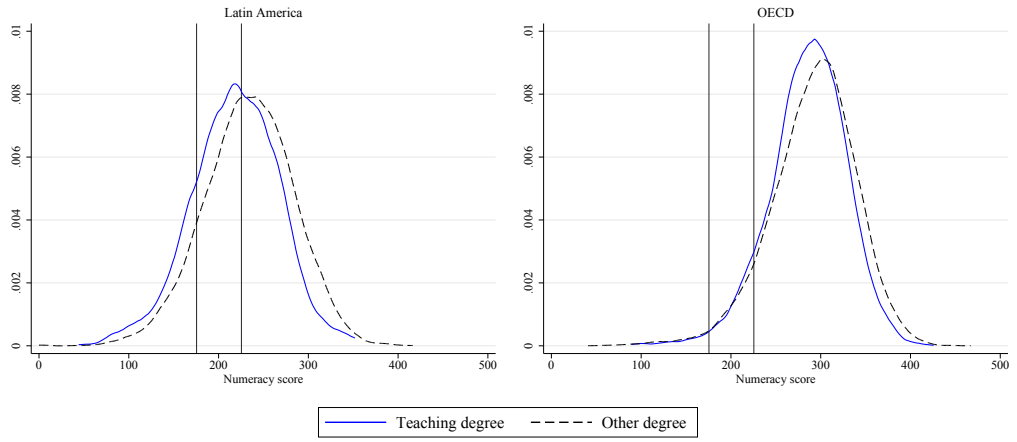

FIGURE 2 Density of Numeracy Scores: Teaching Degrees and Non-teaching Degrees. *Notes:* These figures depict the kernel density of numeracy scores for individuals with tertiary teaching and non-teaching degrees. The sample excludes respondents below the age of 22, university professors, and other teachers at tertiary-level institutions. The first graph plots these densities for respondents from Latin America, whereas the second plots these densities for respondents from OECD-countries with average math and reading PISA scores above the OECD mean in 2015. The vertical lines mark the cutoffs for the proficiency levels below 1 and 1.

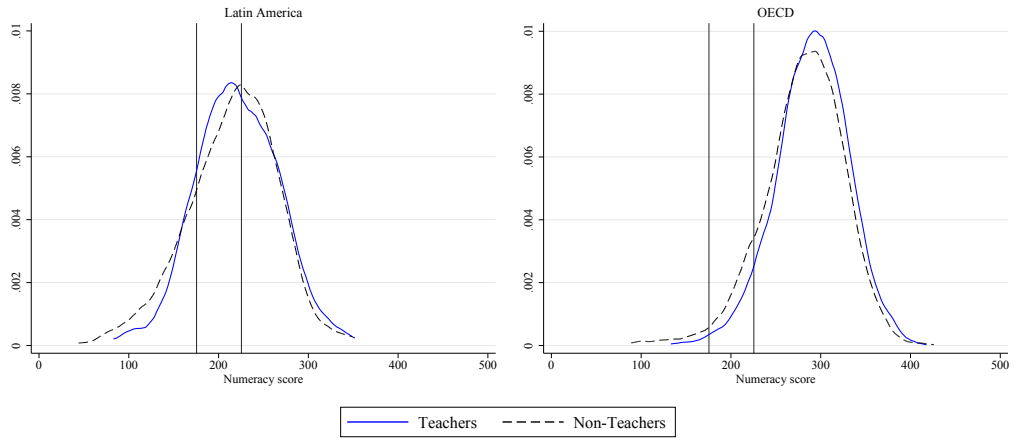

FIGURE 3 Density of Numeracy Scores: Teachers and Non-teachers with Teaching Degrees. *Notes:* These figures depict the kernel density of numeracy scores for teachers and non-teachers with a tertiary teaching degree. The sample excludes respondents below the age of 22, university professors, and other teachers at tertiary-level institutions. The first graph plots these densities for respondents from Latin America, whereas the second plots these densities for respondents from OECD-countries with average math and reading PISA scores above the OECD mean in 2015. The vertical lines mark the cutoffs for the proficiency levels below 1 and 1.

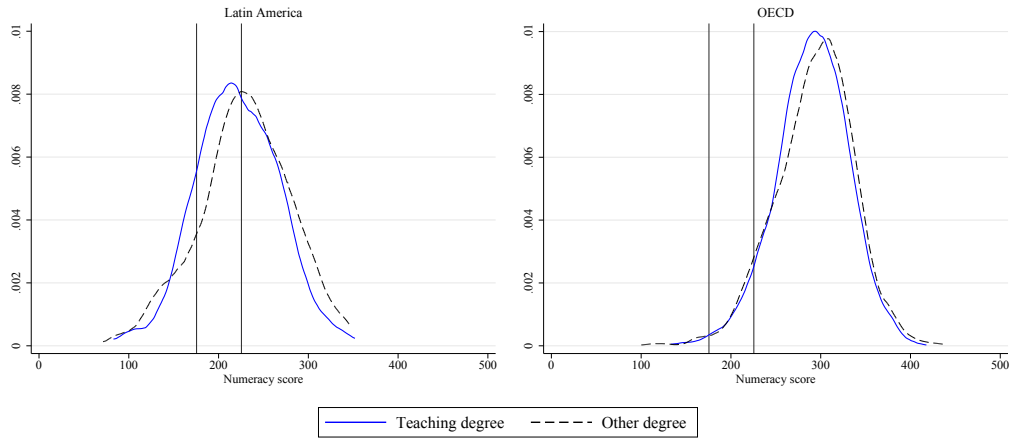

FIGURE 4 Density of Numeracy Scores: Teachers with Teaching and Non-teaching Degrees. *Notes:* These figures depict the kernel density of numeracy scores for teachers with tertiary teaching and non-teaching degrees. The sample excludes respondents below the age of 22, university professors, and other teachers at tertiary-level institutions. The first graph plots these densities for respondents from Latin America, whereas the second plots these densities for respondents from OECD-countries with average math and reading PISA scores above the OECD mean in 2015. The vertical lines mark the cutoffs for the proficiency levels below 1 and 1.

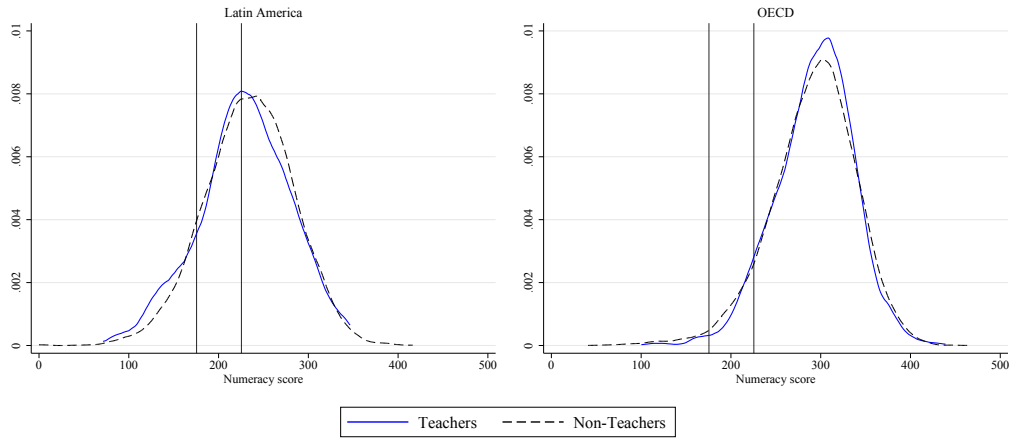

FIGURE 5 Density of Numeracy Scores: Teachers and Non-teachers with Non-teaching Degrees. *Notes:* These figures depict the kernel density of numeracy scores for teachers and non-teachers with a non-teaching tertiary degree. The sample excludes respondents below the age of 22, university professors, and other teachers at tertiary-level institutions. The first graph plots these densities for respondents from Latin America, whereas the second plots these densities for respondents from OECD-countries with average math and reading PISA scores above the OECD mean in 2015. The vertical lines mark the cutoffs for the proficiency levels below 1 and 1.

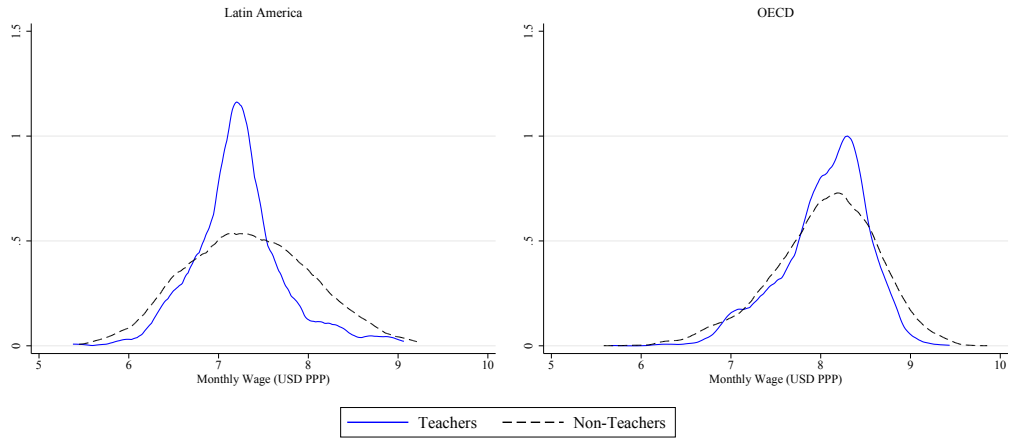

FIGURE 6 Density of Monthly Wages (in ln): Teachers and Non-teachers. *Notes:* These figures depict the kernel density of monthly wages (in ln) for teachers and non-teachers ages 22 and above with a tertiary degree. The first graph plots these densities for respondents from Latin America, whereas the second plots these densities for respondents from OECD-countries with average math and reading PISA scores above the OECD mean in 2015. The sample in both graphs is limited to wage earners that are currently employed, work 20 or more hours a week, and are not in the bottom or top 1 percent of their country's wage distribution. We also exclude university professors and other teachers at tertiary-level institutions.

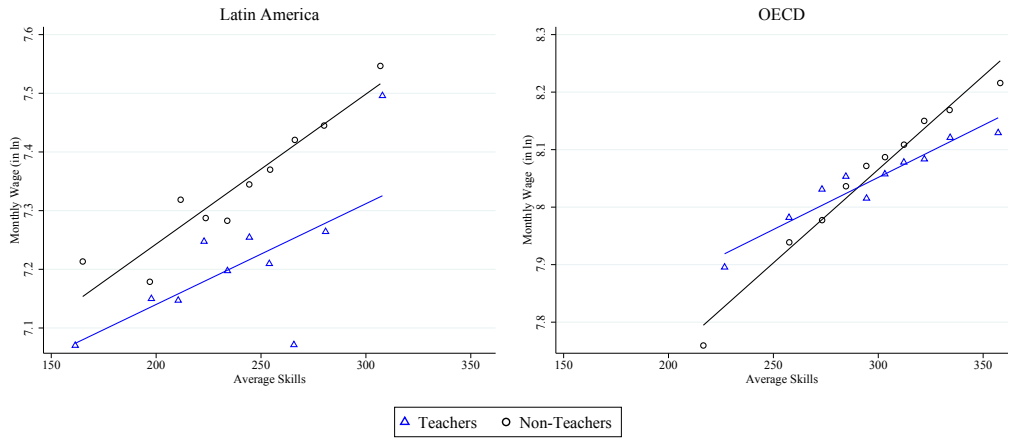

FIGURE 7 Local Means of Monthly Wages by PIAAC Score: Teachers and Non-teachers. *Notes:* These figures plot the monthly wages (in ln) against average numeracy and literacy scores for teachers and non-teachers with a tertiary degree. The lines plot the predicted values of a linear regression controlling for gender, age, age squared, and country fixed effects. The triangles plot the average residuals (with the mean added back) of a regression of monthly wages (in ln) against gender, age, age squared, and country fixed effects. These means are computed for equal-sized bins of average numeracy and literacy scores. The sample in the first graph is composed of respondents from Latin America and the second of respondents from OECD-countries with average math and reading PISA scores above the OECD mean in 2015. The sample in both graphs is limited to respondents ages 22 or above that are wage earners, are currently employed, work 20 or more hours a week, and are not in the bottom or top 1 percent of their country's wage distribution. We also exclude university professors and other teachers at tertiary-level institutions. This figure was made using Stata's user-written command *binscatter*.

A | APPENDIX FIGURES AND TABLES

TABLE A.1 Summary Statistics: Teachers in Latin America

	Mean	SD	Min	Max	N
Panel A: All teachers					
Age	42.028	11.193	22.000	65.000	569
Female	0.719	0.450	0.000	1.000	569
Teaching degree	0.712	0.453	0.000	1.000	569
Non-bachelor's degree	0.186	0.390	0.000	1.000	569
Bachelor's degree	0.698	0.460	0.000	1.000	569
Master's degree or more	0.116	0.320	0.000	1.000	569
Primary school teacher	0.364	0.482	0.000	1.000	569
Secondary school teacher	0.329	0.470	0.000	1.000	569
Early childhood teacher	0.144	0.352	0.000	1.000	569
Teacher at other level	0.163	0.370	0.000	1.000	569
Employed	0.886	0.318	0.000	1.000	569
Panel B: Teachers with a teaching degree					
Age	42.822	10.904	22.000	65.000	405
Female	0.751	0.433	0.000	1.000	405
Non-bachelor's degree	0.222	0.416	0.000	1.000	405
Bachelor's degree	0.664	0.473	0.000	1.000	405
Master's degree or more	0.114	0.318	0.000	1.000	405
Primary school teacher	0.417	0.494	0.000	1.000	405
Secondary school teacher	0.281	0.450	0.000	1.000	405
Early childhood teacher	0.180	0.385	0.000	1.000	405
Teacher at other level	0.121	0.327	0.000	1.000	405
Employed	0.906	0.292	0.000	1.000	405
Panel C: Teachers without a teaching degree					
Age	40.067	11.680	22.000	65.000	164
Female	0.640	0.481	0.000	1.000	164
Non-bachelor's degree	0.098	0.298	0.000	1.000	164
Bachelor's degree	0.780	0.415	0.000	1.000	164
Master's degree or more	0.122	0.328	0.000	1.000	164
Primary school teacher	0.232	0.423	0.000	1.000	164
Secondary school teacher	0.445	0.499	0.000	1.000	164
Early childhood teacher	0.055	0.228	0.000	1.000	164
Teacher at other level	0.268	0.444	0.000	1.000	164
Employed	0.835	0.372	0.000	1.000	164

Notes: This table presents descriptive statistics for the sample of PIAAC respondents ages 22 and above from Latin America that are teachers and have a tertiary degree. The sample excludes university professors and other teachers at tertiary-level institutions, as well as individuals with missing literacy or numeracy scores. Panel B is restricted to teachers with a teaching degree and Panel C, a non-teaching degree.

TABLE A.2 PIAAC Scores: Teachers with Teaching and Non-teaching Degrees (controlling for teaching level)

	Score		Low score		High score	
	Numeracy	Literacy	Numeracy	Literacy	Numeracy	Literacy
Teaching degree	-8.371*	-6.851	0.074	0.058	-0.013	-0.014
	(4.633)	(4.442)	(0.048)	(0.049)	(0.014)	(0.011)
Observations	569	569	569	569	569	569
Observations (teachers)	405	405	405	405	405	405
R^2	0.115	0.117	0.080	0.104	0.016	0.017
Dependent variable mean	223.312	228.630	0.520	0.490	0.016	0.009

Notes: The sample is composed of PIAAC respondents ages 22 and above from Latin America that have a tertiary degree and are teachers. We exclude university professors and other teachers at tertiary-level institutions. This table presents the results of regressions where the independent variables are country fixed effects, a dummy for whether the respondent has a teaching degree, and dummies for whether the respondent instructs at the early education level, primary level, or secondary level. The dependent variables in columns 1 and 2 are the numeracy and literacy scores. The dependent variable in columns 3 and 4 is a dummy for whether the respondent scored below proficiency level 2 in numeracy and literacy, respectively. The dependent variable in columns 5 and 6 is a dummy for whether the respondent scored at level 4 or above. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.