IDB WORKING PAPER SERIES Nº IDB-WP-01073

Teachers' Preferences for Proximity and the Implications for Staffing Schools: Evidence from Peru

Eleonora Bertoni
Gregory Elacqua
Diana Hincapié
Carolina Méndez
Diana Paredes

Inter-American Development Bank
Education Division

October 2019

Teachers' Preferences for Proximity and the Implications for Staffing Schools: Evidence from Peru

Eleonora Bertoni
Gregory Elacqua
Diana Hincapié
Carolina Méndez
Diana Paredes

Inter-American Development Bank
Education Division

October 2019

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Teachers' preferences for proximity and the implications for staffing schools: evidence from Peru / Eleonora Bertoni, Gregory Elacqua, Diana Hincapié, Carolina Méndez, Diana Paredes.
p. cm. — (IDB Working Paper; 1073)
Includes bibliographic references.
1. Teachers-Selection and appointment-Peru. 2. Teachers-Supply and demand-Peru. 3. Public schools-Peru. I. Bertoni, Eleonora. II. Elacqua, Gregory M., 1972- III. Hincapié, Diana. IV. Méndez, Carolina. V. Paredes, Diana. VI. Inter-American Development Bank. Education Division. VII. Series.
IDB-WP-1073

http://www.iadb.org

SCL-EDU@iadb.org
dhincapie@iadb.org

Abstract*

This paper explores rank-ordered teacher candidates' preferences for public schools in Peru by analyzing the 2015 teacher hiring process. Our analysis shows that, in seeking permanent positions in public schools, candidates appear to search closer to where they attended their Teacher Education Program (TEP) and prefer to work in urban areas. Moreover, candidates seem to prefer schools with higher enrollment, basic services and located in wealthier areas. These preferences vary by candidates' attributes. Proximity from their TEP seems to be particularly important for females, while urbanicity is more relevant for candidates with high scores in the national teacher test and older than 35 years old. When controlling for previous workplace location, TEP locations and urbanicity play a less important role in teacher preferences. Understanding which school characteristics teachers value the most can help us design new policies and modify the existing ones to attract teachers to hard-to-staff schools.

JEL Classification: H75, I24, J38, N36

Keywords: Teacher hiring, Teacher preferences, Teacher labor markets, Peru

* We are thankful to Brenda Teruya for providing outstanding research assistance.

1. Introduction

There is considerable evidence that teachers are important for improving educational quality and narrowing racial or socioeconomic achievement gaps (Araujo et al., 2016; Chetty et al., 2014; Hanushek y Rivkin, 2012)[1]. Yet, hiring qualified and effective teachers remains one of the biggest challenges in education. This challenge is even more pressing in schools that serve disadvantaged students, given that evidence shows that effective teachers have a greater academic impact on the lowest performing students (Rivkin, Hanushek & Kain, 2005).

Peru is an example of a school system that struggles to attract high quality teachers to vulnerable schools. In 2015, from a total of 19,630 vacancies advertised for permanent teaching positions, 40% of the openings did not receive any applications. The vacancies that did not have candidates vary by geographical and socioeconomic level and are concentrated in the most disadvantaged areas of the country. More than 50% of unselected school vacancies were located in the two highest quintiles of district poverty[2], and 95% were concentrated in schools in rural areas. The Loreto region (located in the Amazon Rainforest) alone[3] accounts for almost 20% of the unselected vacancies.

These unselected vacancies usually end up being assigned to temporary teachers. This might be worrying given that there is some evidence suggesting that teachers with temporary contracts can have a negative influence on student learning (Ayala & Sánchez, 2016), especially on disadvantaged students (Marotta, 2019). Moreover, in Peru, most of the temporary teachers that end up occupying "undesired" vacancies are low performing teachers who did not pass the national teacher test (*Prueba Unica Nacional* - PUN).[4] In 2016, 69% of temporary teachers hired in unselected vacancies did not achieve the minimum score on the PUN and 27% of them did not even take the test.

Researchers can gain insight into this topic by examining Peru's national teacher assignment process. This paper analyzes teacher candidates' preferences[5] for public schools in Peru in the centralized assignment system by answering the following research questions: i) Which school characteristics drive candidates' preference ranking? and ii) How do these preferences vary according to different candidates' characteristics? To answer these questions,

[1] See also Rivkin et al., 2005 and Rockoff, 2004.
[2] While in the two lowest quintiles of district poverty the unselected vacancies amounted to 26%.
[3] Peru is divided into 26 regions (24 departments and 2 provinces with special regimes, the province of Lima and the constitutional province of Callao).
[4] As per the teacher hiring process defined by the 2012 Law of Magisterial Reform, to be able to apply for a position, teacher candidates need to achieve the minimum score on each of the three sub-tests of the national teacher test (PUN): (1) Logical reasoning (25%); (2) Reading comprehension (25%); and (3) Pedagogical knowledge of the specialization (50%).
[5] More precisely, the teacher candidates that we are examining here are only those who passed the PUN and, thus, could list their preferences for a set of vacancies.

we take advantage of the unique information on stated teacher candidates' preferences provided by the Peruvian Ministry of Education in the 2015 Teacher Hiring Process (*Concurso de Nombramiento*). In Peru, when applying for a position as a permanent teacher, candidates rank school vacancies according to their order of preference.

We take advantage of the detailed information on teacher candidates' ordered preferences and estimate a rank-ordered logit model. This model allows us to analyze how teacher candidates evaluate different vacancies' characteristics when constructing their ranking. Our results reveal that, in seeking permanent positions in public schools, candidates appear to search closer to where they attended their Teacher Education Program (TEP) and prefer to work in urban areas (or closer to their province's capital). These preferences vary by candidates' attributes. Proximity from TEP seem to be particularly important for females, while the urban location is more relevant for candidates with PUN scores in the highest quintile and who are older than 35 years old. In addition, consistent with the literature, candidates prefer larger schools, located in low-poverty districts and with access to basic services.

The literature on teacher labor markets and teacher preferences shows that teachers sort according to specific school characteristics. More precisely, studies in the United States have shown that teachers prefer schools that are closer to their hometown or to where they concluded their teacher education program (Boyd et al., 2005; Engel et al., 2014).[6] Additionally, teachers sort according to student socioeconomic level (Krieg et al., 2016; Boyd et al., 2010; Lankford et al., 2002), student achievement (Boyd et al., 2010; Krieg et al., 2016, Lankford et al., 2002) and tend to prefer schools with better working conditions (Ronfeldt, 2012; for the Netherlands: Bonhomme et al., 2016). At the same time, these preferences often vary according to the teachers' characteristics. For example, female candidates have been found to prefer schools that are closer to their hometown or to where they concluded their teacher education program (Boyd et al., 2005; Krieg at al., 2016), and more qualified teachers are more willing to move further away from their hometown (Boyd et al., 2005), while more experienced teachers tend to stay closer to their teacher education program (Krieg at al., 2016).

In Latin America, the literature on teachers' labor markets is limited to the work of Jaramillo (2013) for Peru and Rosa (2017) for the City of Sao Paulo, Brazil. The former, by collecting survey data in two regions of the country (i.e. Loreto and Lambayeque), suggests the presence of highly-regionalized and low-mobility teacher labor markets in Peru, where almost 80% of the sampled teachers worked in their region of birth or in the region where they graduated from college.

[6] This is in line with what Reininger (2012) found for a set of US States. The author finds that teachers are more likely to be local (live close to their high school hometown) than college graduates in other occupations.

Moreover, teachers in these two regions rarely moved to a different school over their 12-year career (on average). The study by Rosa (2017) analyzes one-sided matching[7] in teacher labor markets in Sao Paulo by estimating a conditional logit model to examine school attributes that are associated with teacher choices. The study provides evidence that teacher choices are largely related to school location, students' socioeconomic characteristics and school quality.

This paper contributes to the literature on teacher labor markets in several ways. First, to the best of our knowledge, this is the first large-scale empirical study on teacher candidates' stated preferences in Latin America. Indeed, the only two other studies focusing on teacher preferences in Latin America restrict their analysis to a single city (Rosa, 2017) and to a sample of regions (Jaramillo, 2013). On the contrary, our analysis is based on a large census of teacher applicants moving through a national centralized admission system. Second, this is the first analysis of the detailed rank-ordered preferences of the 2015 teacher national contest in Peru. The literature on teacher preferences mainly focuses on empirical studies that examine the attributes that determine a candidate's final job allocation (Boyd et al., 2005; Engel et al., 2014; Rosa, 2017), or studies that rely on interview data and teachers' self-reported preferences (Burns et al., 2008; Ronfeldt et al., 2014; Rots et al., 2007). In contrast to these studies, our work relies on teachers' stated preferences for schools. Understanding which school characteristics teachers value the most when they apply to a teaching position can help policymakers effectively tackle the staffing challenges of the most disadvantaged schools in the country.

Education systems in Latin America have implemented different policies to face teacher shortages in hard-to-staff schools. Several countries, including Peru, provide monetary incentives to teachers that work in rural and remote schools. In Chile and Mexico these incentives are higher as the teacher advances in the career path. Countries have also introduced non-monetary incentives for teachers who work in hard-to-staff schools, such as shorter time requirements to apply for a promotion, more flexibility in their teaching schedule, and more training opportunities. To address teacher shortages in rural schools, some countries have established cooperation systems between schools (Chile and Colombia), hybrid classrooms (Pará, Brazil), and programs to strengthen TEP in rural areas (Colombia and Peru).

The rest of the paper is organized as follows. Section 2 describes the institutional context of the Peruvian public-school system. Section 3 introduces the data used in this study and presents descriptive statistics. Section 4 presents the empirical strategies employed in the analysis. Results are presented in section 5. Finally, section 6 concludes and discusses some policy implications.

[7] A one-side matching process is a process in which teachers are completely free to choose the school in which they work. It differs from a two-sided matching where school administrators have the power to refuse teachers.

2. Institutional Context

2.1. Teacher Hiring Process in the Peruvian Public-School System

In 2015, the Peruvian government implemented a new teacher evaluation that was required to obtain a tenured teaching position in the public-school system. To be eligible to apply for a teaching position, candidates had to hold a bachelor's degree in education. The evaluation consisted of two stages: a national stage and a decentralized stage.

The national stage is carried out by the Ministry of Education (MINEDU) and includes a standardized written test (PUN) divided into three sub-tests: logical reasoning (25%), reading comprehension (25%), and pedagogical knowledge of the specialization (50%). To pass the national stage, candidates need to obtain at least 60% of the questions correct on each sub-test. Applicants are evaluated within a specific area of specialization by the education level (pre-primary/primary/secondary) and subject (e.g. Secondary-Sciences) they plan to teach.

Only those candidates who score above the threshold required on the national stage can establish their school preferences within their area of specialization and within one of the 26 regions of Peru. There are two school selection rounds. In the first round, candidates can rank up to 5 school preferences. Then, the Ministry of Education assigns each candidate a maximum 2 out of their 5 preferred schools, based on their PUN score and their preferences ranking. Candidates that missed the first round or were not assigned to any of their school preferences during the first round can participate in the second round. Each vacancy can have up to 20 candidates.[8] A candidate with a relatively lower score in the national stage may be less competitive and not be assigned to any of their 5 preferences in the first round. In the second round, there are no limitations with respect to the number of preferences they can list.

Once candidates have been assigned to up to 2 of their preferred schools, they enter the decentralized stage, which is carried out by each school or by the local education administrative units (*Unidad de Gestión Educativa Local* - UGEL) in the case of single-teacher institutions. The decentralized stage includes an evaluation of their resume (25%), a personal interview (25%), and a classroom observation (50%). To pass the decentralized stage, candidates need a score of 30 points (out of 50) in the classroom observation component.

Finally, the Ministry of Education used the weighted sum of the scores obtained in the national and decentralized stages (the national stage has a weight of 67% on the final score) to

[8] One school can have more than one vacancy in the same area of specialty.

assign the vacancies in order based on merit and on the candidate's preferences[9]. Figure 1 summarizes the 2015 teacher hiring process in Peru.

Upon completion of the appointment process, the candidates who did not manage to get a permanent teaching position will be able to apply for a temporary position. To apply to a position as a temporary teacher, candidates select his or her UGEL of preference that have vacancies in their area of specialization on the PUN. Candidates will only be evaluated according to their final score on the test, without the requirement of a minimum passing score[10] and are hired through a public tender that takes place in each UGEL. Candidates are included in a "list of merit" for each UGEL in descending order according to the score on the centralized stage and those with the highest score will be the first to choose among the available vacancies[11].

2.2. Salary Structure and Incentives

In order to understand candidates' preference ranking we need to weigh in factors that could be motivating teachers throughout their school-selection process. The literature on social psychology (Deci, 1975; Ryan and Deci, 2000, among others) distinguishes two broad types of motivations that shape individuals' decision-making: intrinsic and extrinsic. The former is based on the characteristics that make a certain action inherently enjoyable: that is, we do what we do because we like it or because it makes us feel good, independently of any external stimulus. Extrinsic motivations, on the other hand, are those that push us to take action not because of the action itself but because of its possible consequences.

Considering this framework, among the reasons why teachers could tend not to choose disadvantaged schools during the hiring processes may be due to a lack of extrinsic motivation, that is, a perception that the observable characteristics of schools influencing working conditions do not match their expectations. In this group, for example, there are causes related to travel time, safety in the school environment, perception about the prestige of the teaching career, and

[9] In case of a tie in the final score for the same vacancy, the Ministry of Education applies the following criteria in order of priority to identify a single winner for each vacancy: (1) higher score on the classroom observation; (2) higher score on the pedagogical knowledge of the specialization's sub-test; (3) higher score on the curriculum's educational and professional training; (4) higher score on the curriculum's professional experience; (5) higher score on the curriculum's merits. If the same applicant wins for more than one vacancy, the Ministry of Education will automatically assign the vacancy with the highest priority level, according to the preferences of the applicant.

[10] In cases of a tie for the same vacancies the following criteria will be considered: (1) Score on the classroom observation; (2) higher score on the pedagogical knowledge section of the specialization sub-test; and (3) higher score on the reading comprehension sub-test.

[11] Candidates that do not manage to get a temporary vacancy at this stage will be kept on the list of merit until the following national contest and will participate in subsequent public tenders for vacancies that open throughout the school year until the list of merit has no candidates. If the list of candidates in a particular UGEL does not have candidates, but there are still vacancies available, candidates from different UGELs within the same region can apply for those positions. Finally, if there are vacancies left after this second round of hiring, the hiring committee will evaluate candidates according to an evaluation of educational and professional records.

remuneration. Because of this, and since monetary incentives are one of the policies that educational systems have designed to motivate teachers to choose hard-to-staff schools, we deem important to consider the salary structure of the public teaching career in Peru.

Since the adoption of the Teacher Reform Law (*Ley de Reforma Magisterial* - LRM) in 2013, regardless of the teacher's type of contract, monthly salaries are composed of: basic wage (*Remuneración Integral Mensual* - RIM), incentives, benefits, and bonuses.

The RIM is determined according to the teacher salary scale and working day. The salary scale is composed of 8 levels, where the 8th is the highest and corresponds to 210% of the lowest salary level. All new teachers in the public system receive the first (lowest) salary level. Permanent teachers can increase their salary through public contests after completing the time requirements in each scale, while temporary teachers only receive the salary amount corresponding to the lowest scale.

The monetary incentives are based on school characteristics and location. School characteristics include: (1) single-teacher institutions, corresponding to 7-10% of the basic salary; (2) bilingual school, corresponding to 2.5% of the basic salary; (3) bilingual certification, corresponding to 5% of the basic salary. School location includes: (1) rural areas, corresponding to 3.5%, 5% and 25% of the basic salary according to the "gradient of rurality", defined at the central level based on population size and accessibility to the nearest provincial capital[12]; (2) border areas, corresponding to 5% of the basic salary; (3) difficult areas[13], corresponding to 15% of the basic salary. Teachers can receive up to 5 incentives if they are not mutually exclusive[14]. Permanent and temporary teachers receive the same monetary incentives[15]. Non-monetary incentives are in place for permanent teachers only. For example, working in rural or border areas will increase permanent teachers' reallocation opportunities and will shorten the time of service required to apply for a higher salary scale.

[12] The most rural areas (Rural 1) are those with less than 500 inhabitants located more than 120 minutes from the province capital. The second category of rurality (Rural 2) is reserved for those areas with less than 500 inhabitants and located between 30 and 120 minutes from the province capital or those located in places with 500-2,000 inhabitants located farther than 120 minutes from the province capital. The final set of rural areas (Rural 3) are those with 500-2,000 inhabitants located closer than 120 minutes from the province capital, or those with less than 500 inhabitants and located less than 30 minutes away from the capital. All other areas are classified as urban.

[13] Valle de los Ríos Apurímac, Ene y Mantaro - VRAEM region.

[14] In 2016, only 2% of public-school teachers (5,748) received 5 incentives.

[15] A monetary bonus (*Bono de Atracción*) is in place for candidates that get a permanent position and who score in the upper third of the hiring process scores' distribution. These candidates receive a bonus of approximate $2,000 per year for their first three years of service.

3. Data Description

3.1. Samples

This paper uses administrative data from the 2015 public school teachers' hiring process in Peru. The data include candidates' application by level (pre-primary/primary/secondary) and subject, candidate characteristics such as gender, age, teacher education program attended and years of public/private teaching experience, their scores in every stage of the contest, ranked school preferences within a region, and final assignment to the school where they were granted a permanent position. Moreover, for each school that opened a vacancy, the data includes school characteristics such as location (region, province, district, UGEL), area (urban/rural), type (multi-teacher, multi-grade or single teacher) and an indicator of whether the school is bilingual.

Next, we combine data from the 2015 national contest with school-level data from the 2015 School Census (*Censo Escolar*) database. This database includes school characteristics such as: geographical coordinates; altitude; number of pupils per classroom and access to basic services. Georeferenced data for schools and for candidates' TEP allowed us to compute two measures of distance for each candidate: (i) distance from each selected school to the provincial capital, and (ii) distance from each selected school to the candidates' teacher education program.[16]

In addition, the teacher-level information provided in the 2015 Vacancy Management and Control System database (*Sistema de Administración y Control de Plazas NEXUS*) allowed us to track whether a candidate was working as a temporary teacher in 2015, and in which school. Thus, we were able to compute the distance from each selected school to the school employing the candidate at the time of her candidacy for the 2015 contest. Moreover, school-averaged primary students' scores in the standardized math and reading tests were computed from the 2014 National Student Evaluation (*Evaluación Censal de Estudiantes* - ECE)[17]. Finally, we include poverty rates at the district level from the 2013 Province and District Poverty Map generated by the National Institute of Information and Statistics (INEI, for its Spanish acronym).

3.2. Descriptive Statistics

Table 1 presents a summary of the 2015 teachers' national contest in Peru. On the demand side, out of the 19,630 offered vacancies, only 64% were selected by at least one candidate that passed the national stage. This result varies across education levels: only 50% of the offered vacancies

[16] Distances measured as Euclidean distance in kilometers.
[17] In 2014, the student evaluation was conducted for 2nd grade students (in schools with at least 5 students) and for 4th grade students enrolled in bilingual schools. In 2015, the evaluation extended to 7th grade students.

in pre-primary were selected by at least one candidate (column (2)/(1)), compared to 70% and 89% of primary and secondary respectively. Column (4)/(1) suggests that the available vacancies surpass the number of candidates that passed the national stage (and moved onto the decentralized stage) in pre-primary, which indicates a shortage of qualified teachers at this level.

Figure 2 illustrates the geographical distribution of selected and unselected vacancies, which shows a clear concentration of unselected vacancies in the Amazon area of the country (especially in the regions of Loreto, Ucayali and Madre de Dios). Of the 19,630 offered vacancies, only 41% were finally assigned to a permanent teacher position, which implies that 59% of the offered vacancies were filled by temporary teachers. This result varies substantially across educational levels; only 27% of offered vacancies were filled by a permanent teacher in pre-primary, compared to 46% and 64% in primary and secondary respectively (column (5)/(1) in Table 1).

Table 2 summarizes the characteristics of the offered vacancies and distinguishes between whether they were selected by at least one candidate. Table 2 shows that 22% of total vacancies were offered in urban areas. When looking at unselected vacancies, 59% of these were offered in the most rural areas (rural 1) of the country compared to 5% in urban areas. Overall, 46% of rural vacancies had no candidates compared to 8% of urban ones. Moreover, unselected vacancies were mainly offered in more disadvantaged schools (i.e. schools offering higher monetary compensations and schools located in higher poverty districts). Additionally, unselected vacancies are concentrated in lower performing schools, schools located in more remote areas, and schools that lack basic services.

On the supply side, out of the 192,397 candidates that took the national test, only 13% passed. In this paper we analyze the preferences of the 23,701 teachers' candidates that passed the PUN and established their school preferences.[18] To have a better sense of the group of candidates this analysis focuses on, Table 3 shows a comparison between the group of candidates that passed the PUN and candidates that failed. Candidates who passed the PUN are on average younger and have more years of experience in private schools than those who did not pass. In addition, the group of candidates that passed the PUN have a higher percentage of females, candidates who studied in a public university (versus a pedagogical institute) and candidates whose university is ranked among the top 15 of the country. These characteristics should be kept into account when drawing conclusions from the analysis of the preference set of this group of higher-quality candidates.

[18] Each candidate that passed the PUN could establish their school preference set, composed by up to 5 ranked schools within a region and an area of specialty.

Out of the 23,701 candidates that passed the PUN and ranked their school preferences, 23,319 participated only in the first round of selection, 1,043 participated in both rounds and 382 only participated in the second round.[19] Our estimation sample is composed by 23,046[20] candidates that only participated in the first round of school selection, for a total of 10,174 selected vacancies across 8,489 schools.

Table 4 summarizes the characteristics of the candidates and vacancies in our sample. The candidates were mainly female (72%) and below 35 years of age (55%). 60% of the candidates were working as temporary teachers at the time of the contest's application. Moreover, candidates selected vacancies that were, on average, 150km from their teacher education program (TEP) and 52km from the school they were employed at as temporary teachers. Table 4 also shows that 68% of the selected vacancies are rural and 32% are urban. The average district poverty rate is 42% and the average school size is about 200 students. On average, 71% of the vacancies' schools have basic services.

Table 5 presents vacancies' average characteristics according to candidates' ranking. Vacancies listed as the most preferred option (column 1) are mainly urban, located in areas with lower than average levels of district poverty, offered in schools with higher average size, better services, better average student scores, and which are located in less remote areas.

Table 6 shows the distribution of vacancies' characteristics among candidates' preference sets. In general, geographical and socioeconomic dimensions appear to be driving candidates' vacancy selections. When we divide the sample by candidates' attributes (gender, age and PUN score), we observe heterogeneity in preferences. Indeed, female candidates, older candidates and higher performing candidates have a lower preference for mobility because they select vacancies mainly within the same province (e.g. 64% of female compared to 46% of male candidates) and in less poor areas. At the same time, 40% of female and 49% of better performing candidates builds their set with vacancies located in urban areas, compared to only 33% of male and 31% of lower performing candidates, respectively. Better performing candidates tend to select vacancies closer to their TEP and in less poor areas. This descriptive evidence suggests that candidates' vacancies consideration set may be more limited than the entire set of available

[19] We excluded the 382 candidates that did not register in the first round (1.7% of total candidates and about 4% of selected schools in the 2015 contest) given that candidates can express their preferences over the full set of available vacancies only in the first round. Candidates who only participate in the second round of selection will have to choose among the remaining vacancies, thus limiting the analysis of stated preferences. We verified that the characteristics of the excluded group do not differ substantially from the group of candidates in the first round of selection. Indeed, Table A1 (in Appendix) shows that candidates who did not register in the first round of selection are on average older and have more years of experience in private schools than those who participated in the first round. In addition, candidates in the second round of selection has a higher share of candidates which have studied in a university than in a pedagogical institute.

[20] With respect to the 23,319 candidates in the first round of selection we lose 273 candidates due to lack of information on candidates' characteristics.

vacancies within his/her region and area of specialization, and that preferences may vary a considerable amount according to specific candidates' characteristics.

4. Methodology

The 2015 public school teachers' hiring process data contains ranked preferences for each candidate, which allows us to estimate a rank-ordered logit model to better understand candidate preferences for school characteristics. This model allows us to analyze how candidates combine attributes of alternatives into overall evaluations of the attractiveness of schools (Beggs, Cardel and Haussman, 1981; Hausman and Ruud, 1987; Koop and Poirier, 1994). Previous work that analyzed parental preferences for school characteristics use similar models (Beuermann et al., 2018; Abdulkadiroglu, Pathak and Schellenberg, 2017; Hastings, Kane and Staiger, 2005, 2006). The model coefficients are estimated using the method of maximum likelihood.

In this setting, we model teacher candidates' ranking behavior through a constant utility model where each candidate i $(i = 1, 2, \dots, I)$ has a choice set C_i consisting of J_i alternatives $(j = 1, 2, \dots, J_i)$. The choice set of each candidate is the set of available vacancies within one of 26 regions and a specific area of specialization (educational level and subject, e.g. Secondary-Sciences). The i^{th} candidate's utility function from ranking first alternative j^* from C_i will take the form:

$$U_{ij^*} = x'_{ij^*}\beta + \varepsilon_{ij^*}$$

Where x_{ij^*} is a vector of alternative j attributes (school-level characteristics) which includes distance from the school to the teacher education program, school location (rural/urban), school size, an indicator of whether the school has basic services, poverty at the district level, school mean reading achievement, and a vector of interactive variables relating candidate i to alternative j[21].

If rational choice behavior is assumed, stated preference implies that alternative j^* is preferred to alternative j if:

$$U_{ij^*} \geq U_{ij} \text{ for } (j = 1, 2, \dots, J_i)$$

[21] Among candidates' directly observable school characteristics are the degrees of rurality while other characteristics such as the poverty rate of the district, the number of students, the existence of basic services, the distances and the test scores can be inferred indirectly.

Because the utility function is partly stochastic, the probability of candidate i to rank first alternative j^* from C_i may be written as:

$$P_{ij^*} = P\left(U_{ij^*} \geq U_{ij}, j = 1, 2, \dots, J_i\right)$$
$$= P(\varepsilon_{ij} - \varepsilon_{ij^*} \leq x'_{ij^*} - x'_{ij}, \ j = 1, 2, \dots, J_i)$$

If the stochastic error terms are assumed to be identically and independently distributed (IID) according to the double exponential distribution, one can show that the choice probabilities have the following form (McFadden,1974):

$$P_{ij^*} = \frac{\exp\left(x'_{ij^*}\beta\right)}{\sum_{j=1}^{J_i} \exp\left(x'_{ij}\beta\right)}$$

If one applies the Ranking Choice Theorem (Luce and Suppes, 1965) to the stochastic utility model, assuming that the alternative index j is a serial preference index, it follows that:

$$P\left(U_{i1} \geq U_{i2} \geq \cdots \geq U_{iJ_i}\right) = \prod_{j^*=1}^{J_i} P(U_{ij^*} \geq U_{ij}, j = j^*, \dots, J_i)$$

Where $P\left(U_{i1} \geq U_{i2} \geq \cdots \geq U_{iJ_i}\right)$ is the joint probability that alternative 1 is preferred to alternative 2 which is preferred to alternative 3, and so on to alternative $J_i - 1$ which is preferred to alternative J for candidate i, and β representing the relative importance of the vacancies' characteristics to the sample of candidates. The probability that a candidate i submits a particular ranking on schools within a region and specialization area is a product of standard logit formulas (Train, 2009; Hastings et al., 2006).

4.1. Potential for Strategic Choice

Candidates that pass the national stage, which involves a standardized written test (PUN), can select up to 5 preferred schools. They are assigned up to 2 schools, based on their PUN score and school preferences. Each vacancy can have up to 20 candidates. Almost 15% of the 10,392 selected vacancies had more than 20 interested candidates (i.e. the candidate ranked the vacancy). Within each region and area of specialization, candidates are ranked based on their PUN scores. The candidate with the highest PUN score will be assigned to its top two choices. The candidate with the lowest PUN score would not be assigned to any school, if each of the 5 schools that she selected already had 20 candidates. Out of the 23,319 candidates that

established their school preferences in the first round of selection, 86% were assigned to their first choice, and only 4% were not assigned to any of their preferred schools.[22]

This mechanism may create incentives for candidates with low PUN scores to misstate their preferences, not listing their most preferred schools if they have a low probability of competing for the vacancy or obtaining a permanent position. The PUN score has a weight of 67% in the final score, and the candidate with the highest final score (PUN score plus decentralized stage score) are granted a permanent position. A candidate with a low PUN score, relative to other candidates in the same region and area of specialization, may strategically apply to schools that are less attractive and therefore will likely have fewer candidates, in order to increase the chances of obtaining a permanent position.

Candidates could also attempt to size up their competition before submitting their rank-order list of schools. The list of candidates who passed the PUN, including their disaggregated PUN scores, the region where they took the test, and their area of specialization are publicly available. Candidates compete for permanent positions within a region and an area of specialization. The region where candidates took the test may be different from the region where they apply for a position, and candidates cannot see the regions of application of other candidates.[23] However, if they assume that most candidates remain in the same region, they could size up their competition by adding up the disaggregated PUN scores and calculating a ranking by themselves.

There are some factors that might hinder strategic behavior. First, the novelty of the contest reduces the chances of strategic hedging. Since 2015 was the first year in which the contest was implemented[24], candidates might not have known exactly how the slots for the decentralized stage and permanent positions were assigned or how to calculate their rank position within their region and area of specialization. Even though candidates may not have listed their most preferred schools, the ranking might still reflect their preferences among the selected schools. In other words, the first ranked school should be the most preferred alternative among the selected schools, the second ranked school the most preferred alternative among the rest, and so on. In this paper, we analyze teacher preferences among ranked schools, giving us

[22] Nevertheless, candidates who are not assigned to any school for the decentralized stage after the first selection round can participate in a second selection round, in which they can select among schools with remaining vacancies within their area of specialization.

[23] Out of the 23,319 candidates who passed the PUN and selected vacancies, 90% chose the same region where they took the PUN.

[24] The previous teacher law that was in place between 2007 and 2012 (*Ley de Carrera Magisterial*) held hiring contests in 2009 and 2011. The general structure of the contests was similar to the 2015 contest (with a national and decentralized stage), but there were differences in some instruments and their weights. For instance, in the 2009 contest, the PUN score had a weight of 50% (vs. 67% in the 2015 contest).

information on which school characteristics are associated with a higher rank in their preference set.[25]

5. Results

5.1. Preference Parameter Estimates

Table 7 shows the point estimates from the rank-order logit model. The estimates represent the estimated changes in a candidate's utility for a unit change in the exogeneous variables (Punj and Staelin, 1978). We investigate the importance candidates give to each school characteristic by assessing their sign, relative magnitude, statistical significance, and stability across specifications (Beuermann et al., 2018).

Table 7 presents four specifications: the first two only include school characteristics, and the last two add interactions between school characteristics and candidate attributes. We find that teacher candidates prefer schools (i.e. are better ranked) with higher enrollment and basic services (Column 1 of Table 7). In addition, candidates prefer schools that are closer to their teacher education program (TEP) and that are located in less poor districts. Out of the 23,046 candidates in our sample, 65% selected vacancies in the same region where they studied. The significance of the distance from TEP in shaping the decision is consistent with previous literature on the determinants of teacher's initial job placements (Boyd et al. 2005; Krieg, Theobald and Goldhaber, 2016).

Regarding the urban and rural categories, the rurality base category is composed by the most rural schools (rural 1), which are schools located in areas with less inhabitants and furthest away from the province capital. The coefficients for the least rural (rural 3) and urban schools have significantly positive effects on candidate's utility, with a bigger effect for urban schools, signaling their preference for more urban locations. The coefficient for moderate rural schools (rural 2) is not statistically significant, suggesting that candidates are indifferent between the most rural (rural 1) and moderate rural (rural 2) schools. This last result could be due to that fact that most urban and moderate rural schools share similar constraints in living conditions.

By assessing the sign and magnitudes of the significant point estimates, we can describe scenarios in which candidates are indifferent between different schools' types (i.e. their utility would be the same). We analyze what would it take for a candidate to choose a least rural (rural 3) school in place of an urban school, conditional on other school characteristics being the same.

We find that candidates would be willing to work in a rural 3 (least rural) school instead of an urban school conditional on lower poverty rates, higher enrollment or shorter distance from

TEP. Comparing the coefficients on poverty, urban and least rural, the point estimates suggest that candidates would be indifferent between working in a rural 3 (least rural) school and an urban school when the poverty rate of the least rural school is 10 percentage points lower than the urban one. A comparison with enrollment implies that candidates would be indifferent between working in a rural 3 (least rural) school and an urban school when the enrollment of the least rural school is approximately 490 students higher than the urban one. A comparison with the distance from TEP shows that candidates would be indifferent between working in a rural 3 (least rural) school and an urban school when the distance between the least rural school and TEP is 9km shorter than the distance between the urban school and TEP.

Previous research from the United States suggests that teachers prefer jobs that are closer to their residential location (Engel, Jacob and Curran, 2014; Killeen, Loeb and Williams, 2015; Hanson and Johnston, 1985; Hanson and Pratt, 1988). To reduce the potential that home residence might be endogenous to employment opportunities, other studies include proxies of residency, such as high-school location (Boyd et al., 2005; Reininger, 2012).

We neither have information on candidates' hometown location nor on their residential location[26], but we do have information on the workplace location for the subsample of candidates that were working as temporary teachers in public schools in 2015.[27] The estimates in Column 2 show that candidates prefer schools that are closer to their previous workplace location.[28] The inclusion of distance from the previous workplace eliminates the urban/rural effects and reduces the importance of distance from TEP location. Under this specification, urbanicity is no longer significant, which implies that candidates' previous workplace location is a better predictor of school ranking. In addition, by analyzing the magnitude of the coefficients, we find that the distance from TEP coefficient is 6 times smaller than in previous specifications. This finding highlights the importance of candidate's previous workplace location relative to their TEP location, particularly for this subsample of candidates that has, on average, 8 years of experience.

Out of the 14,220 candidates with previous workplace information, 93% selected vacancies in the same region where they worked in 2015, 67% selected vacancies in the same region where they studied, and 65% in the same region where they studied and worked.[29] Most

[26] Jaramillo (2013) analyses two regions of Peru: Lambayeque and Loreto and found that most teachers work in the same region where they were born (77.0% and 85.9%, respectively).
[27] In 2015, 30% of the teachers in the public sector were temporary teachers (Nexus, 2015). Moreover, out of the 23,046 candidates that selected vacancies for a permanent position, 61% were temporary teachers in public schools.
[28] Assuming that, on average, temporary teachers choose the closest school to their residence. We cannot distinguish between the preferences of the teachers and those of the hiring schools in determining their workplace as temporary teachers. However, given the temporality of the contract (1 school year), teachers might have fewer incentives to move to another region or too far away within a region to work as temporary teachers.
[29] Even though we do not have previous workplace information for 39% of the candidates, we would expect similar preferences for proximity to their previous workplace over proximity to TEP. These candidates have, on average, 7 years of experience, and 70% of them select schools in the same region where they studied.

candidates do not consider moving to another region different from where they studied, which implies that teacher labor markets are generally geographically segmented in Peru. Since most teachers decide to work in the same region where they studied, it is important to develop policies to increase the local supply and quality of teachers in high-deficit regions.

Candidates seem to be willing to work further away from their previous workplace to teach in schools with basic services and located in wealthier areas. A comparison of the coefficients on basic services and distance from their previous workplace implies that candidates are willing to work almost 4 km away from their previous workplace to teach in a school with basic services. Comparing the coefficients on poverty and distance from their previous workplace, the point estimates suggest that candidates are willing to work 6km away from their previous workplace to teach in a school in the 25th percentile of poverty than in one in the 50th percentile.

Next, in order to better understand the coefficients, we compare two hypothetical schools (A and B) which share all characteristics except one. The probability of preferring a school with basic services to one without them is 51%. For continuous variables, Figure 3 shows the probability of preferring school A to school B, as the analyzed characteristic change values for school B. Figures 3.1, 3.3 and 3.4 show that, as the school B is farther away from TEP, farther away from the previous workplace and has higher poverty relative to school A, respectively, the probability of preferring school A increases. Figure 3.2 shows that, as the school B has a higher enrollment than school A, the probability of preferring school A decreases.

In Table A2[30] we present additional specifications for the subsample of candidates that applied to primary schools and whose selected schools have 2014 National Student Evaluation (ECE) results. The ECE was taken on November 2014 by 2nd grade students of primary schools and 4th grade for bilingual schools. The 2014 ECE results were publicly available in February 2015 at the regional level and not at the school level. Even though ECE results at the school level were not public in 2015[31], it represents a proxy for student performance, which could have been shared through teacher networks. In Column 1 we present the results for the sample of 6,502 candidates whose ranking includes schools with ECE results, and in Column 2 we narrowed the sample to the 3,938 candidates that have previous workplace information. In both specifications, the ECE Reading performance is not significant, most likely because the candidates did not have access to ECE results at the school level.[32]

[30] Table in Appendix.
[31] Since 2018, the public has had access to ECE school level results through the school identification website of the Ministry of Education http://identicole.minedu.gob.pe/.
[32] As a robustness check, we include ECE Math scores instead of Reading scores, and the results remain insignificant. These results are available upon request.

5.2. Heterogeneous Effects by Candidates' Attributes

Following Boyd et al. (2005) and Krieg, Theobald and Goldhaber (2016), teachers' preferences for distance from school can vary with their own attributes, such as their gender, age and academic performance.

Literature in the United States shows that, for most women, the job search proceeds from a given residential location, that women travel shorter distances to work than men, and that they are more likely to work within the local community (Hanson and Pratt, 1988). One explanation could be that women are constrained to work close to home because of family responsibilities. In Latin America, traditional gender roles persist, in which women are expected to take most of the household and family responsibilities (OIT, 2019; Ñopo, 2012). Other studies suggest that women's stronger preferences for short distance and commuting time are mainly explained by women's lower income and their greater reliance on public transportation (Hanson and Johnston, 1985). Studies analyzing teacher job markets suggest that female teachers are more likely to work closer to their TEP (Boyd et al., 2005) and to their student teaching location (Krieg, Theobald and Goldhaber, 2016).

Regarding age, the literature shows that, as adults grow older, they become less willing to take risks (Schildberg-Hörisch, 2018). Schurer (2015) documents that risk tolerance declines strongly for all socioeconomic groups from late adolescence up to age 45. From age 45 onwards, risk tolerance continues to decline for the most disadvantaged and stabilizes for all other groups. In addition, younger candidates might have fewer household responsibilities, and therefore, more flexibility to choose their work location.[33] Studies in United States suggest that individuals who begin their teaching career when they are younger are more likely to take jobs farther away from their TEP and their student teaching location, but closer to their hometown (Boyd et al., 2005; Krieg, Theobald and Goldhaber, 2016).

The literature shows mixed results on the impact of teacher academic performance and knowledge (as measured by standardized tests) on distance preferences. On the one hand, Boyd et al. (2005) find that more qualified teachers (measured by SAT scores) are slightly more willing to expand their job search away from their hometown. On the other hand, Krieg, Theobald and Goldhaber (2016) found some evidence that more qualified teachers (measured by college GPA scores) work in schools closer to their student teaching location. To analyze the heterogenous effects by teacher candidates attributes in Peru, we create three dummy variables for: (i) female candidates; (ii) candidates who are less than 35 years old, which represents the 50th percentile of the age variable in our sample; and (iii) candidates who have a national teacher test (PUN) score

[33] While we do not have candidates' marital status information, we assume younger candidates to be more likely to be single, thus might be more flexible to move further away from their residential location while looking for a job.

in the highest quintile. We interact these dummy variables with the distance variables and urban location of schools.

In our sample, a higher percentage of females remain in the same region where they studied and previously worked: 69% of females applied to the same region where they studied (vs. 65% for males), and 94% applied to the same region where they previously worked (vs. 90% for males). In sum, females appear to have stronger preferences for proximity from their TEP and their previous workplace than males. Regarding candidates' age, 70% of candidates less than 35 years old applied to the same region where they studied (vs. 65% for older candidates), and 93% applied to the same region where they previously worked (similar for older candidates). Similarly, a higher percentage of high PUN scores candidates remain in the same region where they studied (73% vs. 67% for low PUN scores candidates).

Columns 3-4 in Table 7 are analogous to Columns 1-2 with the addition of interactions between school characteristics and candidates' attributes. In Column 3 we include the interactions of distance from TEP and urban with candidate's attributes. Females and candidates with high PUN scores have stronger preferences for proximity to their TEP and urban areas, while younger candidates have weaker preferences for more urban areas. Figure 4 compares school A and B, and shows that, as the school B is further away from TEP relative to school A, the probability that school A is preferred to (ranked in a higher position than) school B increases more rapidly for females and high PUN candidates, and more slowly for younger candidates.

Regarding urban location, Figure 5 show the probability that an urban school is preferred to a most rural (rural 1) school for candidates with different attributes, holding other school characteristics constant. Female, older teachers and candidates with high PUN scores have stronger preferences for urban schools. For instance, the probability of preferring an urban school to a most rural (rural 1) school is 56% for candidates with high PUN score, higher than the 53% probability for candidates with lower PUN scores.

The last specification (column 4 of Table 7) adds the interactions between distance from previous workplace and candidate's attributes, for the subsample of candidates with previous workplace information. The results show that candidates with high PUN scores have stronger preferences for schools that are closer to their previous workplace; while females and younger teachers seem to have similar preferences as males and older teachers, respectively. Figure 6 shows the probability of preferring school A over school B, as the distance between the previous workplace and school B change values. As school B is further away from the previous workplace, the probability of preferring school A over school B is higher for high PUN score candidates.

Females show stronger preferences for proximity from TEP and for urban schools. As we control for distance from previous workplace (column 4 of Table 7), the effect of distance from

TEP and urban location vanishes for the base category (for males that are more than 35 years old and have low PUN scores). However, for females, the interactions with distance from TEP and urban continue to be statistically significant. For younger candidates, only the interaction with urban schools is significant; and for high PUN candidates, the interactions with urban schools and with distance from previous workplace are significant. These results are consistent with the literature and suggest that females value proximity to TEP more than other candidates.[34]

5.3. Robustness Checks

In this section we present a series of robustness checks: (i) substitute the urban/rural variables with the distance from the province capital; (ii) include an analysis by educational level; and (iii) estimate a conditional logit model on the first ranked school for each candidate.

5.3.1. Distance from province capital

Table 8 presents the rank-ordered logit results including the school distance from the closest province capital, instead of the urban/rural variables. We do not include distance from the closest province capital and the urban/rural variables in the same regression because the definition of rurality in Peru is based, in part, on travel time to the closest province capital (as explained in section 1) and therefore, these variables are highly correlated. The results in Table 8 suggest that our preferences estimates are not particularly sensitive to this alternative specification.

Considering the sample of all teacher candidates and the specifications without interactions (Column 1 of Table 8), we find that candidates prefer schools that are closer to the province capital, which is consistent with previous research on teacher preferences in developing countries (Rosa, 2017) and preferences for urban schools observed in the baseline results (Table 7). Candidates are willing to work in schools further away from the province capital conditional on the school having basic services or being in wealthier areas. Comparing the coefficients on basic services and distance from capital, the point estimates suggest that candidates are willing to work 15 km away from the capital to teach in a school with basic services. A comparison with the coefficient on poverty implies that candidates are more willing to work 21 km away from the capital to teach in a school in the 25th percentile of poverty than in one in the 50th percentile. When controlling for previous workplace (Column 2 of Table 8), we find that distance from previous workplace plays a more important role in teacher preferences than distance from province capital.

[34] We also analyze the interactions between the candidate's attributes and other school characteristics (enrollment and basic services). These interactions were not significant, and their inclusion did not affect the results of the interactions with distances and urban location.

In the specifications with interactions (Column 3 and 4 of Table 8), we find that females, older teachers and high PUN score candidates have stronger preferences for proximity to the province capital. Figure 7 compares schools A and B, and illustrates that, as school B is further away from the province capital relative to school A, the probability that school A is preferred to (ranked in a higher position than) school B increases more rapidly for females and high PUN candidates, and more slowly for younger candidates. Regarding the interactions with distance from TEP, only the interaction with female remains significant. Moreover, the distance from previous workplace continues to be particularly relevant for high PUN score candidates (Column 4 of Table 8).

5.3.2. Analysis by educational level

As documented in Table 1, the shortage of qualified teacher candidates varies by educational level. For instance, in pre-primary, the offered vacancies surpass the number of candidates that pass the PUN and participate in the decentralized stage. In this context, understanding candidates' preferences by educational level could help policymakers tackle the staffing challenges in the educational levels with highest teacher shortages. Table 9 presents the rank-ordered logit results separately by educational level, for pre-primary, primary and secondary teacher candidates. In the specification with the full sample of candidates and without interactions (Columns 1 in Table 9), we find significant parameter estimates for distance from TEP, poverty, enrollment and distance from previous workplace in all levels, in line with the pooled results (Table 7).

Regarding candidates' attributes, the main difference across education levels is gender: the percentage of female candidates is 99%, 77% and 56% in pre-primary, primary and secondary, respectively. In each level, between 50%-60% of candidates are younger than 35 years old, and between 16%-21% have high PUN scores.

When analyzing the interaction terms (in Columns 3-4 in Table 9), we find some differences in candidates' preferences by educational level. Female candidates in pre-primary and primary do not have significant preferences for proximity to TEP, while the opposite is true for secondary female candidates. Regarding age, younger pre-primary and secondary candidates have weaker preferences for urban areas, while the result does not hold for primary.

High PUN score candidates in pre-primary and primary do no show significant preferences for proximity to TEP and urban areas, and have weaker preferences to proximity to previous workplace, in contrast to secondary candidates (Columns 3-4 in Table 9). This suggest that high performing candidates in pre-primary and primary might be willing to move further away from their previous workplace, which is a proxy for residential location.

Overall, we do not find meaningful differences in the preferences structure among candidates by educational levels. In order to explain the teacher shortage in pre-primary, a deeper analysis of the supply of qualified teachers in this level would be needed.

5.3.3. Conditional logit

Table 10 presents a simple conditional logit specification to examine school characteristics that are associated with candidates' first school choices. This specification estimates the probability of choosing a school as a first choice given the set of characteristics of the other schools included in the candidates' preference set. The conditional logit estimates are consistent with the baseline regressions.[35] The characteristics that explain candidates' first choices are similar to the ones that explain candidates' school ranking. In the first two specifications (Columns 1 and 2 in Table 10), we find significant parameter estimates for distance from TEP, urban, distance from previous workplace, poverty and basic services. The rural categories (Least Rural and Moderate Rural) are not significant under the conditional logit model, given the strong preferences for urban schools as the first choice. Around 62% of candidates rank urban schools first in their preference set. The specifications with interactions (Columns 3 and 4 of Table 10) yielded similar preference results. Females prefer schools that are closer to their TEP, while high PUN score candidates prefer schools closer to their previous workplace. Both females and high PUN score candidates have stronger preferences for urban schools.

6. Conclusions and Policy Implications

There is a significant shortage of permanent teachers in Peru, especially in disadvantaged areas. In the 2015 teachers' national contest, almost 40% of vacancies for permanent teaching positions received no applications. More than 50% of the unselected vacancies were located in the poorest areas of the country and 95% were located in rural areas. These undesired vacancies generally ended up being filled by temporary teachers which, research suggests, can have a negative influence on student learning (Ayala & Sánchez, 2016), especially for disadvantaged students (Marotta, 2019).

In this paper we explore the school preferences of 23,046 permanent teacher candidates in order to identify which public school characteristics drive candidates' school preferences. A central motivation to analyze teacher preferences is to determine ways to attract teachers to hard-to-staff schools. Understanding which school characteristics teachers value the most can help

[35] In the baseline regressions (Table 7) we estimate a rank-ordered logit model using the rankings of candidates' top five school choices.

policymakers design effective policies to improve permanent teachers' allocation by attracting them to the most disadvantaged schools.

Our analysis shows that, in seeking a permanent position in public schools, candidates appear to prefer schools that are closer to where they attended their Teacher Education Program (TEP) and located in urban areas (or closer to the province capital). These preferences vary by candidates' attributes: Proximity from TEP seems to be particularly important for females, while urban location is more relevant for high performing (i.e. with high PUN score) and older candidates. When controlling for previous workplace location, TEP and urban location play a less important role in teacher preferences. Candidates' previous workplace location, which is a proxy of residential location, is more relevant than where they studied, particularly for this subsample of candidates that has, on average, 8 years of experience. In addition, candidates prefer larger schools located in low-poverty districts and with access to basic services.

Most permanent positions are offered in rural areas, but 46% of rural vacancies did not have any applicants in the 2015 contest. More attractive incentives and better working conditions are likely to influence teachers' preferences to choose to work in a rural school. Peru has introduced monetary and non-monetary incentives to attract qualified teachers (i.e. candidates that pass the PUN) to take jobs further away from urban areas. There are financial incentives for teachers that work in schools with specific characteristics such as rural, single-teacher or multi-grade, and bilingual schools. Moreover, teachers that work in rural schools have shorter time requirements to apply for a promotion and will have more flexibility in their teaching schedule.[36] Even though these policies are in the right direction, our results suggest that these incentives are not enough to compensate for candidates' strong preferences for urban schools. As a result, rural vacancies end up being filled with less qualified teachers (i.e. candidates that do not pass the PUN and have temporary contracts).

Candidates seem to prefer working in larger schools, a characteristic correlated with urban location. These results suggest that teachers value working in schools with other colleagues and with more resources. Due to demographic trends and geographic limitations, small and isolated schools have become a pressing problem in many countries. To address this challenge, some systems have developed different models of cooperation between rural schools. In one model, a group of independent schools cooperate and share resources. For instance, in Chile, *microcentros rurales* provide teachers in rural areas with a space to meet, to collaborate, and to share best practices to address their common challenges (OECD, 2017). In another model,

[36] For instance, teachers in rural schools could work for 20 days and then rest for 10 days, or they could teach intensively for 3 days a week (instead of 6 hours for 5 days a week). The policy was approved in 2018 (Supreme Decree N 013-2018-MINEDU) and has not yet been implemented.

adopted by Portugal and Colombia, a group of schools are organized as a cluster, under a consolidated administration. The headquarter school receives and allocates the resources to the rest of the schools in the cluster. Descriptive evidence in Portugal suggests that school clusters had a positive impact on student retention and learning, reduced the isolation of teachers, optimized the supply of different grade levels, and increased the permanence of teachers and the availability of resources for students and teachers (Matthews et al., 2009). In Colombia there are no significant differences in student achievement between schools organized in clusters and single-site schools. At the same time, evidence suggests that school sites belonging to multi-site schools, especially those in larger networks and located far away from the school's main site, tend to have younger teachers, which earn lower salaries and that are more likely to have a temporary contract (Elacqua, Sanchez y Santos, 2019).

In the process of increasing cooperation and strengthening rural schools, technology can play an important role. Where geographic conditions do not allow for frequent commuting of students and teachers, hybrid classrooms that mix face-to-face with online/satellite learning could be an alternative. For instance, in Para, Brazil, students receive satellite classes from a specialized teacher, together with the support of a local teacher or teacher assistant in the class. Regarding teacher training and networks, periodic face-to-face interactions among teachers within a cluster and access to online platforms could allow them to share experiences and classroom materials.

Given the relevance of proximity from the TEP for teacher school preferences, particularly for women, it is important to analyze which areas are "net importers" of teachers. Rural areas might not produce as high of a proportion of teachers as urban areas, and they might face a less-qualified pool of potential teachers. In some rural areas, high school graduates might not have higher education opportunities or might not receive adequate teacher training. As a result, schools in remote and rural areas need to attract teachers from other areas, for which they must pay a premium. In this scenario, in addition to improving working conditions, "grow your own" programs can help to increase the supply of teachers in rural areas (Boyd et al., 2005). By supporting high-school students and improving TEP in rural areas, the pool of TEP graduates that are more likely to become teachers in rural areas could increase. Similarly, given the preference for proximity to previous workplace, providing training to temporary teachers that already work in rural schools could be an alternative. In 2018, Peru approved new policies to increase the supply and improve the quality of teachers in rural areas. The government is developing a training program that grants teaching certification to talented young people from indigenous groups and is designing incentives for TEP teachers with high academic competencies and research experience in rural education.[37]

[37] Policies approved in 2018 (Supreme Decree N 013-2018-MINEDU) and which have not yet been implemented.

Latin American countries face high teacher shortages in rural areas and therefore have adopted different strategies during the hiring process. In Ecuador and Colombia there are hiring contests exclusively for vacancies in rural areas and in post-conflict areas, respectively. In Colombia, these contests give more weight to the academic and work experience, and do not include a personal interview, in comparison to regular contests. Another alternative for incentivizing candidates in Peru to consider working in rural schools could be to cover the transportation costs and allow more flexible schedules for the decentralized stage of the contest (interviews and mock class) in these schools. Currently, candidates must pay for their own transportation costs and have no flexibility to schedule the decentralized stage of the evaluation, which could withhold them from applying to schools farther away from their current location.

Our analysis suggests that some candidates could be indifferent between working in an urban school and in a rural 3 (least rural) school if the poverty rate is marginally lower. While reducing poverty in rural areas is crucial, in the short-term, policies can help mitigate the challenging conditions of working in schools located in poor districts. Some education systems in the region, such as Chile, recognize that working in schools with high proportions of poor students can be more challenging, and they offer higher salaries to teachers and additional resources to these schools to hire support personnel and provide better teaching materials. In both Chile and Mexico, the monetary incentive for teachers that work in disadvantaged schools is higher as the teacher advances in the career path (i.e. has more experience and passes the evaluations) (Elacqua et al. 2018).

Understanding the geographical scope of teacher labor markets is crucial to determine which candidates are more willing to work in hard-to-staff schools. This paper highlights the importance of proximity to TEP and previous workplace (as a proxy for residential location). We have workplace information for 61% of candidates in our sample that were working as temporary teachers in public schools in 2015. At the same time, it is possible that the workplace location is endogenous to employment opportunities. A more complete analysis would include the residential location and hometown location of candidates as literature suggests that most teachers prefer to teach close to where they grew up or in districts and schools that are similar to the ones they attended as students (Boyd et al., 2005). Unfortunately, we currently do not have this information for candidates in Peru.

The 2015 hiring contest was the first one under the new teacher Law (*Ley de Reforma Magisterial*). In this paper, we analyze the preferences of the candidates that pass the PUN and therefore were able to submit their school ranking (up to 5 schools). However, candidates that pass the PUN only represent 13% of the 192,397 candidates that took the test in 2015. For the 2017 and 2018 hiring contests, some changes have been implemented. Candidates that pass the

PUN can rank as many schools as they want, which aims to reduce the number of schools left without candidates. Future studies could analyze how changes in the hiring process design may affect candidates' preferences and explore the possibility of using techniques from behavioral sciences to nudge candidates to select hard-to-staff or disadvantaged schools.

The teacher Law establishes that the hiring process for permanent positions should be held every 2 years. However, given the amount of available vacancies (35,000) in 2018, a modification to the teacher Law[38] allows for annual hiring processes between 2018 and 2022. In the 2017 and 2018 hiring contests, only 28% of the available vacancies were filled with a full-time teacher (less than the 41% of the 2015 hiring contest). These results highlight the urgency to improve initial and continuous teacher training (since most candidates do not pass the PUN) and to create better incentives to attract candidates to rural areas and regions with low teacher supply (candidates that pass the PUN but do not select those vacancies). Teachers are the most important factor for improving student learning, with the greatest impact on the lowest performing and most disadvantaged students. Hiring effective teachers in schools that serve disadvantaged students is a pressing challenge in Peru and, more broadly, in Latin America.

[38] Law N° 30747

References

Abdulkadiroglu, A., Pathak, P., Schellenberg, J., & Walters, C. (2017) Do Parents Value School Effectiveness? NBER Working Paper No.23912.

Araujo, M. C., Carneiro, P., Cruz-Aguayo, Y., & Schady, N. (2016). Teacher quality and learning outcomes in kindergarten. *The Quarterly Journal of Economics*, 131(3), 1415-1453.

Ayala, M.C. & Sánchez, F. (2017). Efecto de los docentes provisionales sobre desempeño académico: Evidencia para la educación secundaria oficial en Colombia. Bogotá: Universidad de los Andes.

Beggs, S., S. Cardell, & J. A. Hausman. (1981). Assessing the potential demand for electric cars. *Journal of Econometrics* 17(1), 1-19.

Beuermann, D., Jackson, K., Navarro-Sola, L., & Pardo, F. (2018) What is a Good School, and Can Parents Tell? Evidence on the Multidimensionality of School Output. NBER Working Paper No.25342.

Bonhomme, S., Jolivet, G., & Leuven E. (2016). School Characteristics and Teacher Turnover: Assessing the Role of Preferences and Opportunities. *The Economic Journal,* 126(594), 1342-1371.

Boyd, D., Lankford, H., Loeb, S., & Wyckoff, J. (2005). The Draw of Home: How Teachers' Preferences for Proximity Disadvantage Urban Schools. *Journal of Policy Analysis and Management*, 24(1), 113-132.

Boyd, D., Lankford, H., Loeb, S., & Wyckoff, J. (2013). Analyzing the Determinants of the Matching of Public School Teachers to Jobs: Disentangling the Preferences of Teachers and Employers. *Journal of Labor Economics*, 31(1), 83-117.

Boyd, D., Lankford, H., Loeb, S., Ronfeldt, M., & Wyckoff, J. (2010). The Role of Teacher Quality in Retention and Hiring: Using Applications to Trabsfer to Uncover Preferences of Teachers and Schools. *Journal of Policy Analysis and Management*, 30(1), 88-110.

Burns, B. A., Grande, M., & Marable, M. (2008). Factors influencing teacher candidates' participation in a paid field experience with urban students. *Issues in Teacher Education*, 17(2), 101-116.

Chetty, R., Friedman, J., & Rockoff, J. (2014). Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood. *American Economic Association, 104*(9), 2633-2679.

Deci, E. (1975). Intrinsic Motivation, in Perspectives in Social Psychology. Springer US, Plenum Press, New York, 1, XI-324.

Elacqua, G., Hincapie, D., Vegas, E., & Alfonso, M. with Montalva, V., & Paredes, D. (2018). *Profesión: Profesor en América Latina. ¿Por qué se perdió el prestigio y como recuperarlo?* Inter-American Development Bank, Washington, DC.

Elacqua, G., Sanchez, F. & Santos, H. (2019). School Reorganization Reforms: The Case of School Networks in Colombia. IDB Working Paper Series N. IDB-WP-01044.

Engel, M. (2012). Problematic Preferences? A Mixed Method Examination of Principals' Preferences for Teacher Characteristics in Chicago. *Educational Administration Quarterly*, 49(1), 52-91.

Engel, M., Jacob, B. A. & Curran F. C. (2014). New Evidence on Teacher Labor Supply. *American Educational Research Journal,* 51(1), 36-72.

Hanson, S., & Johnston, I. (1985). Gender differences in work-trip length: Explanations and implications, *Urban Geography*, 6, 193–219.

Hanson, S., & Pratt, G. (1988). Reconceptualizing the links between home and work in urban geography. *Economic Geography*, 64(4), 299–321.

Hanushek, E. A. & Rivkin, S. G. (2012). The Distribution of Teacher Quality and Implications for Policy. *The Annual Review of Economics,* (4), 131–57.

Hastings, J., Kane, T. J., & Staiger, D.O. (2005). Parental Preferences and School Competition: Evidence from a Public School Choice Program. NBER Working Paper No. 11805.

Hastings, J., Kane, T. J., & Staiger, D.O. (2006). Preferences and heterogeneous treatment effects in a public-school choice lottery. NBER Working Paper No. 12145.

Hausman, J. A., & Ruud, P. A. (1987). Specifying and testing econometric models for rank-ordered data. *Journal of Econometrics* 34(1), 83-104.

Jaramillo, M. (2013). Apego al terruño: La geografía especial de los mercados laborales de docentes. Documento de Investigación n.68, Grupo de Análisis para el Desarrollo (GRADE).

Killeen, K., Loeb, S., & Williams, I. (2015). A double draw of proximity: The importance of geography in teacher application and hiring decisions. CEPA Working Paper No. 15-19. Stanford Center for Education Policy Analysis (CEPA).

Koop, G. & Poirire, D. J. (1994. Rank-Ordered Logit Models: An Empirical Analysis of Ontario Voter Preferences. *Journal of Applied Econometrics*, 9(4), 369-388.

Krieg, J. M., Theobald, R. & Goldhaber, D. (2016). A Foot in the Door: Exploring the Role of Student Teaching Assignments in Teachers' Initial Job Placements. *Educational Evaluation and Policy Analysis*, 38(2), 364-388.

Lankford, H., Loeb, S. and Wyckoff, J. (2002). Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis. *Educational Evaluation and Policy Analysis*, 24 (1), pp. 38-62.

Marotta, L. (2019). Teachers' Contractual Ties and Student Achievement: The Effect of Temporary and Multiple-School Teachers in Brazil. *Comparative Education Review* 63(3), 356-376.

Matthews, P., Klaver, E., Lannert, J., Conluain, G., & Ventura, A. (2009), Policy Measures Implemented in the First Cycle of Compulsory Education in Portugal. International Evaluation for the Ministry of Education, Office for Education Statistics and Planning, Ministry of Education, Portugal.

Ñopo, H. (2012). *New Century, Old Disparities*. The World Bank. https://doi.org/10.1596/978-0-8213-8686-6

OECD. (2017). Organization of the school offer. OECD Review of Policies to Improve the Effectiveness of Resource Use in Schools

OIT. (2019). Panorama Laboral Temático 5: Mujeres en el mundo del trabajo. Retos pendientes hacia una efectiva equidad en América Latina y el Caribe. Lima: OIT / Oficina Regional para América Latina y el Caribe.

Punj, G., & Staelin, R. (1978). The Choice Process for Graduate Business Schools. Journal of *Marketing Research*, XV, 588-98.

Reininger, M. (2012). Hometown disadvantage? It depends on where you're from: teachers' location preferences and the implications for staffing schools. *Educational Evaluation and Policy Analysis, 34*(2), 127-145.

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools and academic achievement. *Econometrica*, 73(2), 417–458.

Rockoff, J.E. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *American Economic Review*, 94 (2), 247–252.

Ronfeldt, M. (2012). Where Should Student Teachers Learn to Teach? Effects of Field Placement School Characteristics on Teacher Retention and Effectiveness. *Educational Evaluation and Policy Analysis*, 34(1), 3-26.

Ronfeldt, M., Kwok, A., & Reininger, M. (2014). Teachers' Preferences to Teach Undeserved Students. *Urban Education*, 51(9), 995-1030.

Rosa, L. (2017). Teacher Preferences in Developing Countries Evidences from the City of Sao Paulo, Brazil. Stanford University. Draft.

Rots, I., Aelterman, A., Vlerick, P., & Vermeulen, K. (2007). Teacher education, graduates' teaching commitment and entrance into the teaching profession. *Teaching and Teacher Education*, 23, 545-556.

Ryan, R.M. & Deci, E. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary Educational Psychology 25, 54-67.

Schildberg-Hörisch, H. (2018). Are Risk Preferences Stable? *Journal of Economic Perspectives*, 32(2), 135-154.

Schurer, S. (2015). Lifecycle patterns in the socioeconomic gradient of risk preferences. *Journal of Economic Behavior & Organization*, 119(C), 482-495.

Table 1: Summary statistics of 2015 teacher hiring process in Peru

	Offered vacancies	Selected vacancies	Candidates in national stage	Candidates in decentralized stage	Candidates that won a vacancy				
	(1)	(2)	(3)	(4)	(5)	(2)/(1)	(3)/(1)	(4)/(1)	(5)/(1)
Pre-primary	8,896	4,356	28,775	5,654	2,432	49%	3.2	0.6	27%
Primary	6,460	4,496	77,594	6,597	2,949	70%	12.0	1.0	46%
Primary - Physical Ed.	55	52	2624	144	38	95%	47.7	2.6	69%
Secondary (total)	4,219	3,754	83,404	11,306	2,718	89%	19.8	2.7	64%
Secondary - Arts	428	378	4,807	404	207	88%	11.2	0.9	48%
Secondary - Sciences	286	284	9,292	817	225	99%	32.5	2.9	79%
Secondary - Communication	564	563	17,317	3277	530	100%	30.7	5.8	94%
Secondary - Physical Ed.	229	228	7,846	769	205	100%	34.3	3.4	90%
Secondary - Religion	703	420	2,433	212	138	60%	3.5	0.3	20%
Secondary - Vocational Ed.	641	544	11,649	1244	355	85%	18.2	1.9	55%
Secondary - Civic Ed.	137	133	1491	387	116	97%	10.9	2.8	85%
Secondary - History, Geography, Econ.	172	172	9629	913	149	100%	56.0	5.3	87%
Secondary - English	494	469	5,178	1,040	316	95%	10.5	2.1	64%
Secondary - Math	453	453	11,826	1,838	387	100%	26.1	4.1	85%
Secondary - Humanities	112	110	1936	405	90	98%	17.3	3.6	80%
Total	19,630	12,658	192,397	23,701	8,137	64%	9.8	1.2	41%

Table 2: Vacancies' characteristics according to whether they were selected by at least one candidate

	All vacancies	Unselected vacancies	Selected vacancies	t-test	N.
Most Rural (Rural 1)	36%	59%	23%	***	16,743
Moderate Rural (Rural 2)	28%	30%	28%	***	16,743
Least Rural (Rural 3)	13%	7%	17%	***	16,743
Urban	22%	5%	32%	***	16,743
Poverty (%)	47%	56%	42%	***	16,588
Enrollment (100s)	1.63	0.56	2.28	***	16,740
Basic services	53%	32%	66%	***	16,576
Distance from prov. capital (km)	29.45	42.55	21.58	***	16,743
Student test scores in Reading (standardized)	-0.06	-0.64	0.17	***	3,518
Student test scores in Math (standardized)	-0.07	-0.75	0.10	***	2,871
N.	16,743	6,283	10,460		

Table 3: Candidates' characteristics according to their performance in the National Teacher Test

	All	Candidates that do not pass the test	Candidates that pass the test	t-test
Age	37.1	37.5	34.5	***
Female	66%	65%	72%	***
Teaching experience in public schools (years)	4.51	4.54	4.24	***
Teaching experience in private schools (years)	2.17	2.01	3.31	***
Studied in an Institute	62%	64%	47%	***
Studied in a Public Institute	43%	44%	35%	***
Studied in a Private Institute	20%	22%	12%	***
Studied in a University	38%	36%	53%	***
Studied in a Public University	27%	25%	43%	***
Studied in a Private University	11%	11%	10%	***
Studied in a rural Institute or University	5%	5%	3%	***
Studied in a University ranked in the top 15	9%	8%	16%	***
Teacher test score	99.1	92.3	147.5	***
N.	192,397	168,696	23,701	

Table 4: Summary statistics for the Rank-ordered logit analysis

	N.	Mean	Std. Dev.	Min	Max
School Ranking	105,061	3.09	1.41	1	5
Candidate-level characteristics					
Female	23,046	72%	45%	0	1
Age < 35	23,046	55%	50%	0	1
Teacher test score Q5	23,046	19%	39%	0	1
Temporary teacher in 2015	23,046	61%	49%	0	1
Distance from Teacher Education Program (km)	23,046	149	252	0.1	1,844
Distance from previous workplace (km)	13,901	51	89	0	1,510
Vacancy-level characteristics					
Most Rural (Rural 1)	10,174	23%	42%	0	1
Moderate Rural (Rural 2)	10,174	28%	45%	0	1
Least Rural (Rural 3)	10,174	17%	38%	0	1
Urban	10,174	32%	47%	0	1
Poverty (%)	10,174	42%	22%	0.0	97.4
Enrollment (100s)	10,174	2.28	3.51	0.0	28.7
Basic services	10,174	67%	47%	0	1
Distance from prov. capital (km)	10,174	21.6	17.7	0.0	158.0
Student test scores in Reading (standardized)	2,465	-0.4	1.2	-5.1	3.9
Student test scores in Math (standardized)	2,275	-0.3	1.2	-4.2	3.7

Note: Teacher test score Q5 is a dummy variable for candidates who have a national teacher test (PUN) score in the highest quintile. Basic services include electricity, water and sanitation.

Table 5: Vacancies' characteristics by candidates' school ranking

	School ranking					t-test	N.
	1	2	3	4	5	1 vs 5	
Most Rural (Rural 1)	8%	8%	9%	9%	10%	***	105,061
Moderate Rural (Rural 2)	14%	16%	16%	17%	18%	***	105,061
Least Rural (Rural 3)	16%	17%	17%	17%	16%		105,061
Urban	62%	59%	58%	57%	56%	***	105,061
	100%	*100%*	*100%*	*100%*	*100%*		
Poverty (%)	30%	31%	31%	31%	32%	***	105,061
Enrollment (100s)	4.06	3.72	3.71	3.57	3.47	***	105,061
Basic services	85%	83%	83%	82%	81%	***	105,061
Distance from prov. capital (km)	15.23	16.28	16.46	17.02	17.80	***	105,061
Student test scores in Reading (standardized)	0.03	0.00	-0.01	-0.03	-0.05	***	26,505
Student test scores in Math (standardized)	0.03	0.01	-0.01	-0.03	-0.06	***	25,770

Note: This table shows vacancies' average characteristics according to candidates' ranking. In the school ranking, column 1 indicates teacher candidate's most preferred option while column 5 indicates the least preferred one. The rural and urban categories sum 100%.

Table 6: Choice set composition according to candidate's characteristics

	Candidates' characteristics									
	All	**Male**	**Female**	**t-test**	**Age > 35**	**Age < 35**	**t-test**	**Teacher test score Q5**	**Teacher test score Q1**	**t-test**
Province										
Just 1 province	59%	46%	63%	***	61%	57%	***	64%	55%	***
Multiple provinces	41%	54%	37%	***	39%	43%	***	36%	45%	***
Degree of rurality										
Just urban	38%	33%	40%	***	44%	33%	***	49%	31%	***
Just rural	22%	21%	22%	**	18%	24%	***	14%	30%	***
Just Most Rural (Rural 1)	2%	3%	1%	***	1%	2%	***	1%	4%	***
Just Moderate Rural (Rural 2)	1%	1%	1%	***	1%	1%	***	1%	2%	***
Just Least Rural (Rural 3)	1%	1%	1%	***	1%	1%	***	1%	1%	
Mix rural	18%	17%	18%	***	15%	19%	***	11%	23%	***
Mix urban/rural	40%	46%	38%	***	37%	43%	***	38%	39%	***
Distance from Teacher Education Program (100km)										
Just Q1	7%	4%	9%	***	8%	7%	***	11%	4%	***
Just Q2	6%	4%	6%	***	6%	6%		7%	5%	***
Just Q3	6%	5%	6%	***	6%	6%		6%	6%	
Just Q4	9%	12%	8%	***	9%	9%	*	7%	10%	***
Just Q5	18%	18%	18%	**	20%	16%	***	15%	21%	***
Mix Q1-Q5	54%	57%	53%	***	51%	56%	***	55%	53%	**
Poverty (%)										
Just Q1	40%	30%	44%	***	46%	35%	***	50%	34%	***
Just Q2	3%	3%	3%	***	3%	3%		3%	4%	***
Just Q3	2%	2%	1%	***	1%	2%	***	1%	2%	***
Just Q4	1%	1%	1%	*	1%	1%	***	1%	1%	***
Just Q5 (poorest)	2%	3%	1%	***	1%	2%	***	1%	2%	***
Mix Q1-Q5	52%	61%	49%	***	47%	57%	***	45%	56%	***

Note: This table shows the distribution of vacancies' characteristics among candidates' preference sets. The categories within a variable sum 100%. For continuous variables we present the distribution of candidates' preferences over the variables' quintiles (Q1-Q5). ***p<0.01, **p<0.05, *p<0.1

Table 7: Rank-ordered logit results

Dependent variable: School ranking					
		Without interactions		With interactions	
		All	Candidates w/previous workplace information	All	Candidates w/previous workplace information
		(1)	(2)	(3)	(4)
Distance from Teacher Education Program (km)		-0.0055***	-0.0009***	-0.0051***	0.0000
		(0.0002)	(0.0003)	(0.0003)	(0.0005)
Urban		0.1689***	0.0991***	0.1440***	0.0648
		(0.0258)	(0.0325)	(0.0371)	(0.0472)
Least Rural (Rural 3)		0.0895***	0.0375	0.0913***	0.0384
		(0.0237)	(0.0294)	(0.0237)	(0.0294)
Moderate Rural (Rural 2)		0.0096	-0.0004	0.011	-0.0006
		(0.0215)	(0.0264)	(0.0215)	(0.0264)
Poverty (%)		-0.4800***	-0.3614***	-0.4759***	-0.3536***
		(0.0446)	(0.0578)	(0.0447)	(0.0580)
Basic services		0.0536***	0.0486***	0.0518***	0.0472***
		(0.0137)	(0.0171)	(0.0137)	(0.0171)
Enrollment (100s)		0.0101***	0.0078***	0.0104***	0.0082***
		(0.0016)	(0.0022)	(0.0016)	(0.0022)
Distance from previous workplace (km)			-0.0099***		-0.0099***
			(0.0003)		(0.0005)
Distance from Teacher Education Program (km)	*female			-0.0009***	-0.0012**
				(0.0003)	(0.0005)
	*age < 35			0.0005	-0.0003
				(0.0003)	(0.0005)
	*teacher test score Q5			-0.0011**	0.0002
				(0.0005)	(0.0008)
Urban	*female			0.0878***	0.0877**
				(0.0297)	(0.0383)
	*age < 35			-0.0943***	-0.0883**
				(0.0279)	(0.0363)
	*teacher test score Q5			0.1039***	0.1321***
				(0.0357)	(0.0452)
Distance from previous workplace (km)	*female				-0.0001
					(0.0005)
	*age < 35				0.0006
					(0.0005)
	*teacher test score Q5				-0.0024***
					(0.0008)
N.		105,061	63,398	105,061	63,398
Candidates		23,046	13,901	23,046	13,901

Note: Columns 2 and 4 consider the subsample of candidates with previous workplace information. Regarding urban/rural variables, the omitted category is Most Rural (Rural 1). ***p<0.01, **p<0.05, *p<0.1

Table 8: Rank-ordered logit results - Distance from the province capital

Dependent variable: School ranking					
		Without interactions		With interactions	
		All	Candidates w/previous workplace information	All	Candidates w/previous workplace information
		(1)	(2)	(3)	(4)
Distance from Teacher Education Program (km)		-0.0052***	-0.0009***	-0.0048***	0.0000
		(0.0002)	(0.0003)	(0.0003)	(0.0005)
Distance from prov. capital (km)		-0.0038***	-0.0004	-0.0037***	-0.0000
		(0.0004)	(0.0005)	(0.0008)	(0.0011)
Poverty (%)		-0.4884***	-0.4134***	-0.4801***	-0.4037***
		(0.0442)	(0.0572)	(0.0442)	(0.0573)
Basic services		0.0678***	0.0624***	0.0664***	0.0616***
		(0.0134)	(0.0167)	(0.0134)	(0.0167)
Enrollment (100s)		0.0124***	0.0107***	0.0126***	0.0109***
		(0.0015)	(0.0021)	(0.0015)	(0.0021)
Distance from previous workplace (km)			-0.0099***		-0.0099***
			(0.0003)		(0.0005)
Distance from Teacher Education Program (km)	*female			-0.0007*	-0.0011**
				(0.0004)	(0.0005)
	*age < 35			0.0001	-0.0005
				(0.0004)	(0.0005)
	*teacher test score Q5			-0.0008	0.0004
				(0.0005)	(0.0008)
Distance from prov. capital (km)	*female			-0.0025***	-0.0022**
				(0.0008)	(0.0011)
	*age < 35			0.0035***	0.0025**
				(0.0008)	(0.0011)
	*teacher test score Q5			-0.0027**	-0.0025*
				(0.0011)	(0.0014)
Distance from previous workplace (km)	*female				-0.0000
					(0.0005)
	*age < 35				0.0005
					(0.0005)
	*teacher test score Q5				-0.0022***
					(0.0008)
N.		105,061	63,398	105,061	63,398
Candidates		23,046	13,901	23,046	13,901

Note: Columns 2 and 4 consider the subsample of candidates with previous workplace information.
***p<0.01, **p<0.05, *p<0.1

Table 9: Rank-ordered logit results by educational level

Dependent variable: School Ranking													
	Pre-primary				Primary				Secondary				
	Without interactions		With interactions		Without interactions		With interactions		Without interactions		With interactions		
	All	Candidates w/previous workplace information	All	Candidates w/previous workplace information	All	Candidates w/previous workplace information	All	Candidates w/previous workplace information	All	Candidates w/previous workplace information	All	Candidates w/previous workplace information	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	
Distance from Teacher Education Program (km)	-0.0072***	-0.0032***	-0.0028	0.0036	-0.0035***	-0.0002	-0.0029***	0.0000	-0.0060***	-0.0006*	-0.0054***	-0.0000	
	(0.0005)	(0.0007)	(0.0042)	(0.0081)	(0.0003)	(0.0005)	(0.0007)	(0.0012)	(0.0002)	(0.0003)	(0.0004)	(0.0006)	
Urban	0.3249***	0.1589**	0.3634	0.1222	0.1773***	0.0974*	0.1594**	0.0872	0.0490	0.0174	0.0378	0.0048	
	(0.0598)	(0.0737)	(0.5720)	(0.6117)	(0.0419)	(0.0540)	(0.0752)	(0.0994)	(0.0456)	(0.0583)	(0.0544)	(0.0693)	
Least Rural (Rural 3)	0.1676***	0.0335	0.1695***	0.0299	0.1012***	0.0231	0.1022***	0.0224	0.0115	0.0098	0.0167	0.0160	
	(0.0483)	(0.0574)	(0.0483)	(0.0574)	(0.0375)	(0.0474)	(0.0376)	(0.0475)	(0.0441)	(0.0561)	(0.0441)	(0.0562)	
Moderate Rural (Rural 2)	0.0374	-0.0299	0.0392	-0.0326	0.0632**	0.0422	0.0639**	0.0409	-0.0668	-0.0388	-0.0627	-0.0369	
	(0.0437)	(0.0513)	(0.0437)	(0.0513)	(0.0305)	(0.0377)	(0.0306)	(0.0377)	(0.0442)	(0.0559)	(0.0442)	(0.0559)	
Poverty (%)	-0.3593***	-0.1427	-0.3587***	-0.1509	-0.3319***	-0.2494**	-0.3301***	-0.2536**	-0.6380***	-0.5451***	-0.6299***	-0.5279***	
	(0.1035)	(0.1270)	(0.1036)	(0.1272)	(0.0804)	(0.1066)	(0.0806)	(0.1071)	(0.0633)	(0.0829)	(0.0634)	(0.0831)	
Basic services	-0.0054	0.0148	-0.0062	0.0154	0.0516**	0.0574**	0.0508**	0.0564*	0.0971***	0.0634**	0.0938***	0.0603*	
	(0.0246)	(0.0293)	(0.0246)	(0.0293)	(0.0232)	(0.0289)	(0.0232)	(0.0289)	(0.0241)	(0.0313)	(0.0241)	(0.0314)	
Enrollment (100s)	0.0421***	0.0343**	0.0419***	0.0337**	0.0095**	0.0121**	0.0096**	0.0123**	0.0097***	0.0065***	0.0097***	0.0066***	
	(0.0126)	(0.0166)	(0.0126)	(0.0166)	(0.0038)	(0.0051)	(0.0038)	(0.0051)	(0.0018)	(0.0025)	(0.0018)	(0.0025)	
Distance from previous workplace (km)		-0.0107***		-0.0186*		-0.0085***		-0.0104***		-0.0104***		-0.0094***	
		(0.0007)		(0.0104)		(0.0005)		(0.0012)		(0.0004)		(0.0006)	
Distance from Teacher Education Program (km) *female			-0.0045	-0.0063			-0.0008	-0.0008			-0.0013***	-0.0008	
			(0.0042)	(0.0081)			(0.0007)	(0.0011)			(0.0004)	(0.0007)	
*age < 35			0.0003	-0.0018			-0.0003	-0.0002			0.0006	0.0001	
			(0.0011)	(0.0015)			(0.0007)	(0.0010)			(0.0004)	(0.0007)	
*teacher test score Q5			-0.0007	0.0038**			0.0013	0.0029**			-0.0021***	-0.0016	
			(0.0014)	(0.0020)			(0.0010)	(0.0014)			(0.0007)	(0.0010)	
Urban *female			0.0659	0.0865			0.0714	0.0509			0.0532	0.0606	
			(0.5702)	(0.6090)			(0.0646)	(0.0842)			(0.0377)	(0.0489)	
*age < 35			-0.1493**	-0.0423			-0.0775	-0.0802			-0.0797**	-0.1043**	
			(0.0672)	(0.0869)			(0.0522)	(0.0691)			(0.0380)	(0.0493)	
*teacher test score Q5			-0.0666	-0.1018			0.0530	0.1011			0.1790***	0.2471***	
			(0.0803)	(0.1000)			(0.0670)	(0.0848)			(0.0500)	(0.0642)	
Distance from previous workplace (km) *female				0.0068				0.0019*				-0.0013*	
				(0.0103)				(0.0011)				(0.0007)	
*age < 35				0.0020				0.0008				0.0001	
				(0.0014)				(0.0010)				(0.0007)	
*teacher test score Q5				-0.0018				0.0001				-0.0037***	
				(0.0019)				(0.0014)				(0.0011)	
N.	26,097	16,936	26,097	16,936	31,258	18,895	31,258	18,895	47,706	27,567	47,706	27,567	
Candidates	5,519	3,578	5,519	3,578	6,586	3,989	6,586	3,989	10,941	6,334	10,941	6,334	

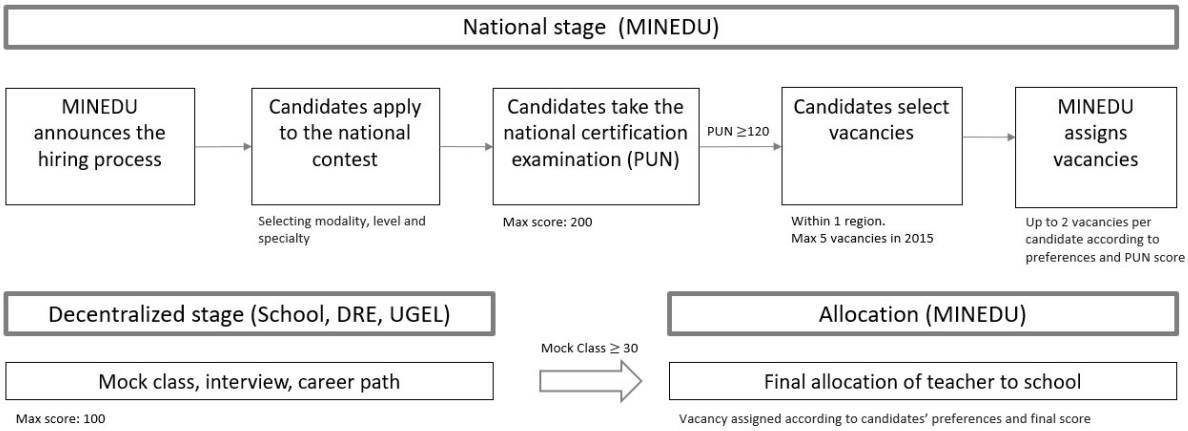
Note: Columns 2 and 4 consider the subsample of candidates with previous workplace information. Regarding urban/rural variables, the omitted category is Most Rural (Rural 1). ***p<0.01, **p<0.05, *p<0.1

Table 10: Conditional logit model results

Dependent variable: First ranked school					
		Without interactions		With interactions	
		All	Candidates w/previous workplace information	All	Candidates w/previous workplace information
		(1)	(2)	(3)	(4)
Distance from Teacher Education Program (km)		-0.0069***	-0.0010**	-0.0058***	0.0007
		(0.0003)	(0.0005)	(0.0006)	(0.0010)
Urban		0.1783***	0.0798	0.0976	-0.0077
		(0.0468)	(0.0593)	(0.0661)	(0.0847)
Least Rural (Rural 3)		0.0442	-0.0238	0.0448	-0.0233
		(0.0435)	(0.0543)	(0.0435)	(0.0543)
Moderate Rural (Rural 2)		-0.0359	-0.0633	-0.0353	-0.0636
		(0.0398)	(0.0489)	(0.0399)	(0.0489)
Poverty (%)		-0.8178***	-0.6140***	-0.8159***	-0.6065***
		(0.0795)	(0.1046)	(0.0797)	(0.1049)
Basic services		0.1007***	0.0788**	0.0983***	0.0773**
		(0.0254)	(0.0316)	(0.0254)	(0.0317)
Enrollment (100s)		0.0216***	0.0187***	0.0220***	0.0193***
		(0.0027)	(0.0037)	(0.0027)	(0.0037)
Distance from previous workplace (km)			-0.0159***		-0.0152***
			(0.0005)		(0.0010)
Distance from Teacher Education Program (km)	*female			-0.0014**	-0.0018*
				(0.0006)	(0.0010)
	*age < 35			-0.0002	-0.0010
				(0.0006)	(0.0010)
	*teacher test score Q5			-0.0016*	0.0000
				(0.0009)	(0.0015)
Urban	*female			0.1301**	0.1265*
				(0.0523)	(0.0681)
	*age < 35			-0.0646	-0.0509
				(0.0493)	(0.0646)
	*teacher test score Q5			0.1467**	0.1537*
				(0.0640)	(0.0819)
Distance from previous workplace (km)	*female				-0.0004
					(0.0010)
	*age < 35				0.0008
					(0.0010)
	*teacher test score Q5				-0.0070***
					(0.0015)
N.		103,320	62,341	103,320	62,341

Note: Columns 2 and 4 consider the subsample of candidates with previous workplace information. Regarding urban/rural variables, the omitted category is Most Rural (Rural 1). ***p<0.01, **p<0.05, *p<0.1

Figure 1: 2015 Teacher hiring process in Peru



Note: Ministry of Education (*Ministerio de Educación* - MINEDU). National Teacher Test *(Prueba Única Nacional* - PUN*).* Regional Education Directorates (*Dirección Regional de Educación* - DRE). Local Education Management Units (*Unidad de Gestión Educativa Local* - UGEL).

Figure 2: Distribution of vacancies' lists offered in the 2015 teacher hiring process

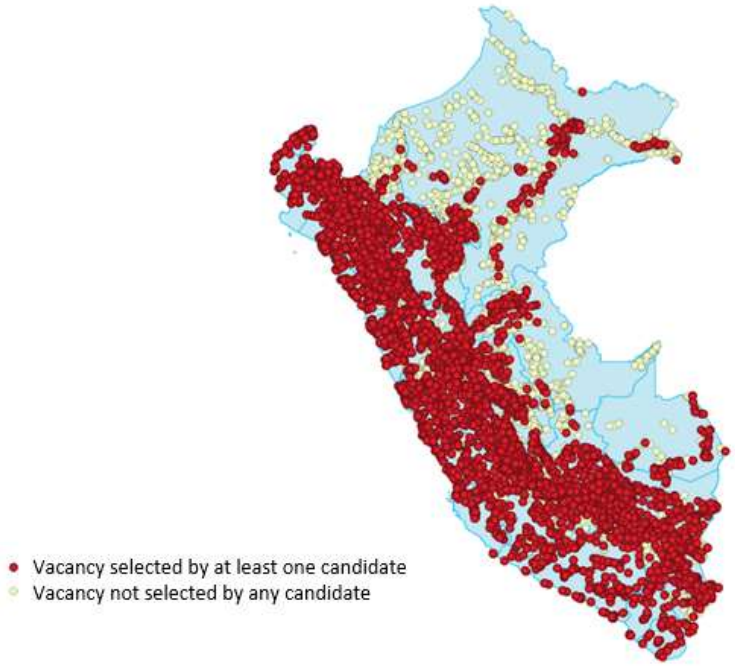
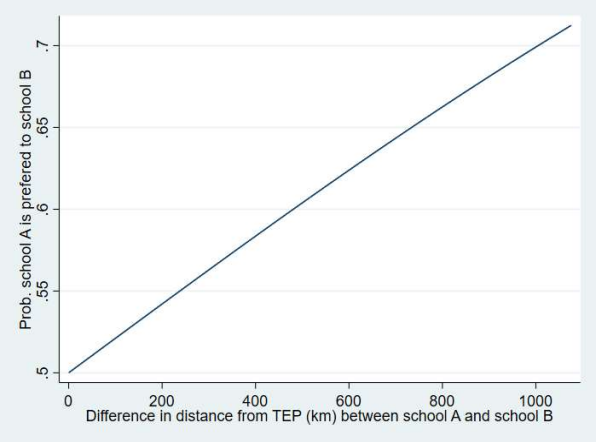
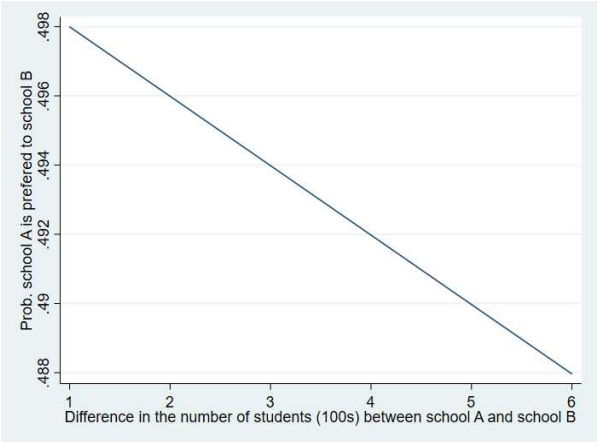


Figure 3: Probability of preferring School A to School B, as a characteristic in School B changes

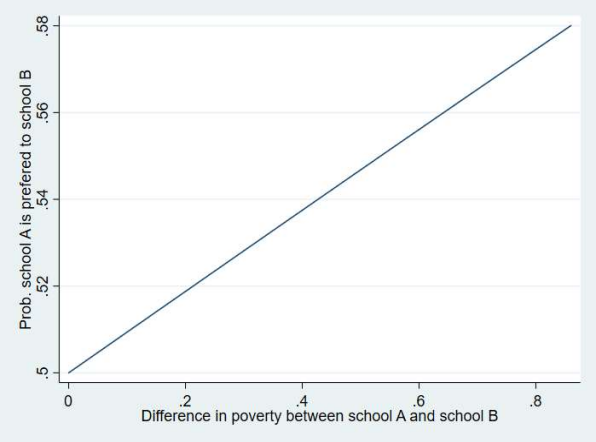
3.1 Distance from the Teacher Education Program (TEP) location



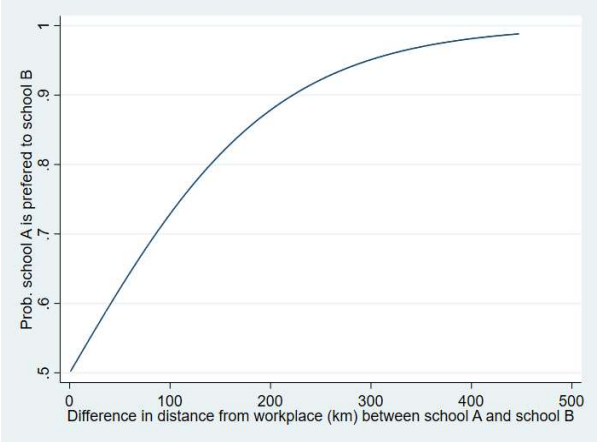
3.2 Enrollment



3.3 Poverty



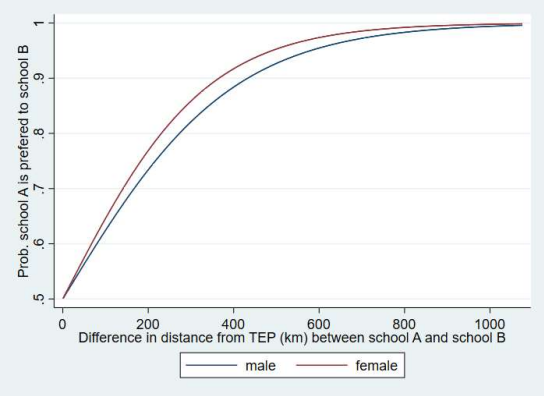
3.4 Distance from workplace



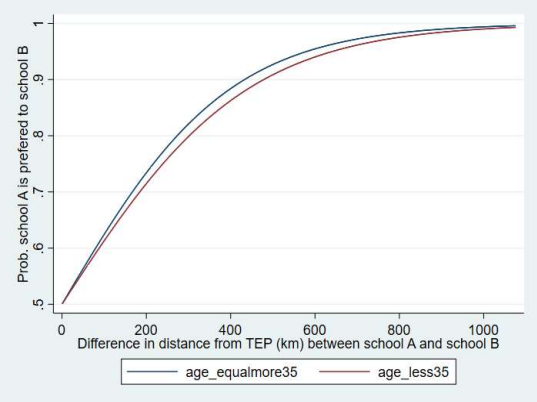
Note: School A and school B are two hypothetical schools which share all characteristics except one. These graphs show the probability of preferring school A to school B, as the analyzed characteristic change values for school B. The probabilities were calculated using the estimated coefficients in Model 2 of Table 7. The X-axis shows the difference in the analyzed characteristic between school A and school B until it reaches the 99th percentile for each characteristic.

Figure 4: Probability of preferring a school closer from their Teacher Education Program (TEP) location

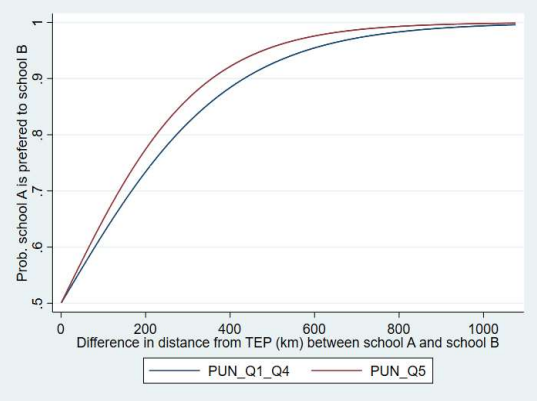
4.1 Gender



4.2 Age

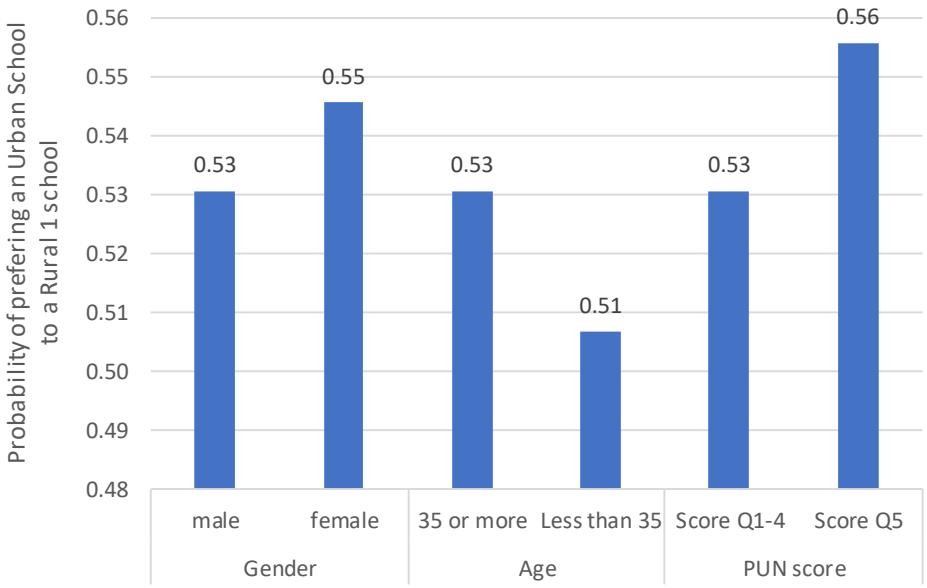


4.3 National Teacher Test (PUN) score



Note: School A and school B are two hypothetical schools which share all characteristics except the distance from TEP. These graphs show the probability of preferring school A to school B, as school B is farther away from TEP. The probabilities were calculated using the estimated coefficients in Model 3 of Table 7. The X-axis shows the differences until it reaches the 99th percentile for the distance from TEP.

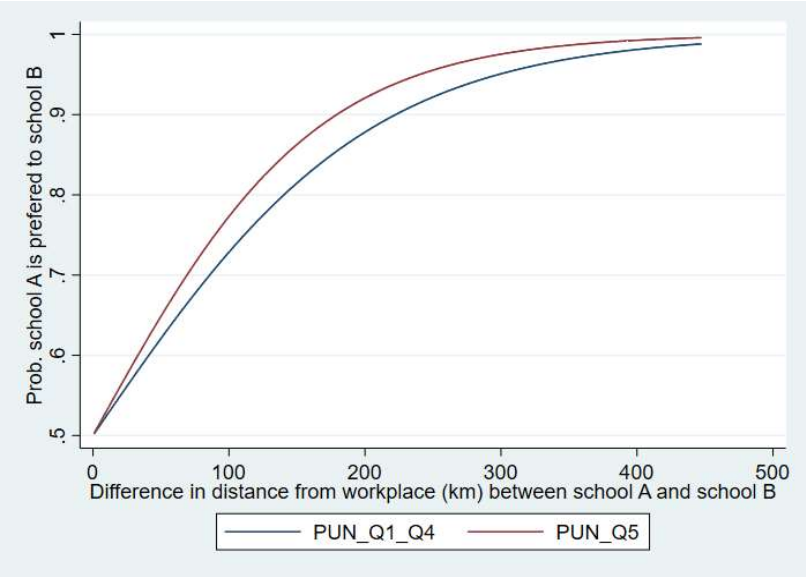
Figure 5: Probability of preferring an Urban school to a Most Rural (Rural 1) school



Note: The probabilities were calculated using the estimated coefficients in Model 3 of Table 7. National Teacher Test *(Prueba Única Nacional* - PUN).

Figure 6: Probability of preferring a school closer from previous workplace

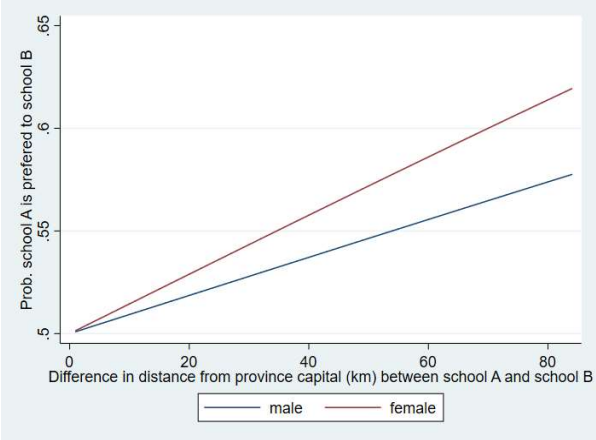
National Teacher Test (PUN) score



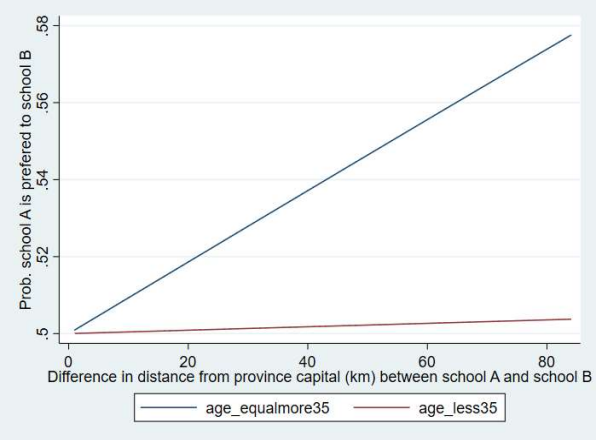
Note: School A and school B are two hypothetical schools which share all characteristics except the distance from the previous workplace. These graphs show the probability of preferring school A to school B, as school B is farther away from the previous workplace. The probabilities were calculated using the estimated coefficients in Model 4 of Table 7. The X-axis shows the differences until it reaches the 99th percentile for the distance from previous workplace.

Figure 7: Probability of preferring a school closer from province capital

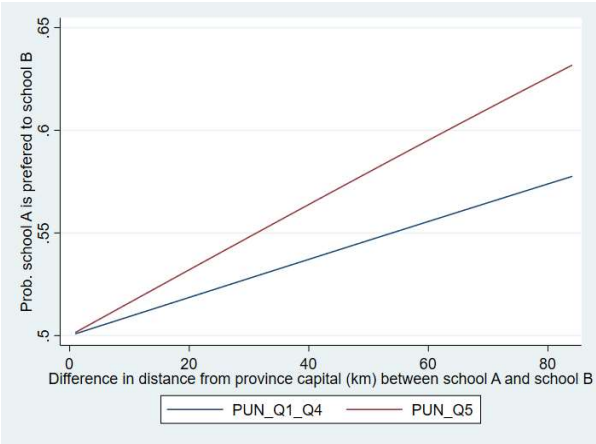
7.1 Gender



7.2. Age



7.3 National Teacher Test (PUN) score



Note: School A and school B are two hypothetical schools which share all characteristics except the distance from the province capital. These graphs show the probability of preferring school A to school B, as school B is farther away from the province capital. The probabilities were calculated using the estimated coefficients in Model 3 of Table 8. The X-axis shows the differences until it reaches the 99th percentile for the distance from province capital.

Appendix

Table A1: Candidates' characteristics according to the selection round they participated in

	All Candidates	Candidates in first round	Candidates only in second round	t-test
Age	34.5	34.5	35.3	**
Female	72%	72%	69%	
Public experience (years)	4.24	4.24	4.11	
Private experience (years)	3.31	3.30	3.85	**
Studien in an Institute	47%	47%	41%	**
Studied in a Public Institute	35%	35%	32%	
Studied in a Private Institute	12%	12%	9%	**
Studied in a University	53%	53%	59%	**
Studied in a Public University	43%	43%	46%	
Studied in a Private University	10%	10%	13%	*
Studied in a rural Institute or University	3%	3%	3%	
Studied in a University ranked in the top 15	16%	16%	17%	
Teacher test score	147.5	147.6	145.0	***
N.	23,701	23,319	382	

Table A2: Rank-order logit results in the subsample with student test results

Dependent variable: School ranking					
		Without interactions		With interactions	
		All	Candidates w/previous workplace information	All	Candidates w/previous workplace information
		(1)	(2)	(3)	(4)
Distance from Teacher Education Program (km)		-0.0038***	-0.0005	-0.0038***	-0.0009
		(0.0004)	(0.0006)	(0.0009)	(0.0016)
Urban		0.1107**	0.0472	0.1179	0.0472
		(0.0530)	(0.0678)	(0.0874)	(0.1148)
Least Rural (Rural 3)		0.0694	-0.0028	0.0715	-0.0034
		(0.0491)	(0.0620)	(0.0492)	(0.0623)
Moderate Rural (Rural 2)		0.0516	0.0314	0.0526	0.0284
		(0.0427)	(0.0524)	(0.0427)	(0.0524)
Poverty (%)		-0.5127***	-0.3080**	-0.5120***	-0.3058**
		(0.0965)	(0.1301)	(0.0967)	(0.1305)
Basic services		0.0909***	0.0812**	0.0908***	0.0795**
		(0.0297)	(0.0370)	(0.0297)	(0.0370)
Enrollment (100s)		0.0135***	0.0147***	0.0135***	0.0151***
		(0.0039)	(0.0053)	(0.0039)	(0.0053)
Student test scores in Reading (standardized)		-0.0035	0.0056	-0.0034	0.0052
		(0.0113)	(0.0144)	(0.0113)	(0.0144)
Distance from previous workplace (km)			-0.0084***		-0.0110***
			(0.0006)		(0.0015)
Distance from Teacher Education Program (km)	*female			-0.0003	-0.0005
				(0.0009)	(0.0014)
	*age < 35			0.0002	0.0002
				(0.0008)	(0.0013)
	*teacher test score Q5			0.0006	0.0047**
				(0.0011)	(0.0018)
Urban	*female			0.0632	0.0767
				(0.0719)	(0.0941)
	*age < 35			-0.0943	-0.1212
				(0.0581)	(0.0774)
	*teacher test score Q5			0.0168	0.0772
				(0.0746)	(0.0955)
Distance from previous workplace (km)	*female				0.0018
					(0.0014)
	*age < 35				0.0020
					(0.0012)
	*teacher test score Q5				-0.0017
					(0.0018)
N.		26,505	15,791	26,505	15,791
Candidates		6,502	3,937	6,502	3,937

Note: The subsample with student test (ECE) results considers candidates for primary schools that have selected schools with 2014 ECE results. Columns 2 and 4 restricts the subsample to candidates with previous workplace information. Regarding urban/rural variables, the omitted category is Most Rural (Rural 1). As a robustness check, we include ECE Math scores instead of Reading scores, and ECE results remain insignificant. ***p<0.01, **p<0.05, *p<0.1.