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Evidence from a Voluntary Award Program

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Abstract[*]

This paper analyzes the effects on teacher retention and between-school mobility of a program that rewards excellence in pedagogical practice in Chile. Teachers apply voluntarily for the award and those who succeed on a set of assessments receive a 6 percent annual wage increase for up to 10 years. A sharp regression discontinuity design is used to identify the causal effect of receiving the award. Using administrative data over several cohorts of applicants, the estimates indicate that locally the award does not alter transitions out of the school system. This suggests that around the threshold the skills rewarded by the program are not strongly correlated with the value of the teachers' outside option. An increase in mobility, however, is observed within the school system among teachers who receive the award. These mobility patterns are consistent with the award providing a signal of teacher quality.

JEL classification: I21, J45, J63, M52
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1. Introduction

Public school systems around the world are daunted by the task of hiring, motivating and retaining good teachers for their classrooms.[1] Yet compensation policies in many countries do not provide much help in achieving this goal. For example, among OECD countries, schoolteachers make around 85 percent of the average earnings of tertiary educated full time workers (OECD, 2017). In Chile, like in the United States,[2] teachers are paid less than two-thirds of what similarly educated workers in other occupations make; not surprisingly, 7 percent of Chilean teachers leave the public school system every year.

Increasing wages for all teachers or for teachers with certain qualifications will result in higher retention rates (see, for example, Clotfelter et al., 2008; Dolton and Van der Klaauw, 1995 and 1999; Falch, 2011; Hanushek, Kain and Rivkin, 2004; and Ransom and Sims, 2010).[3] Nonetheless, there are two main drawbacks of this policy. First, education ministries already spend around 60 percent of their budget on teachers' compensation (OECD, 2017) and large wage increases across the board may be economically and politically unfeasible. Second, and more importantly, higher wages may not lead to more effort (and ultimately better student outcomes) because these increases are not necessarily related to better teacher performance (De Ree et al., 2018).

Indeed, some turnover may not be undesirable if those that are leaving the school system are the worst teachers.[4] But how do we retain the best teachers? Tying some part of teachers' compensation to performance may help to attract, motivate and retain high-quality workers (Gibbons, 1998).[5] Suppose that workers have a noisy private signal of their ability that becomes

[1] According to UNESCO (2016), for example, 69 million new teachers will be required to reach the 2030 sustainable development goals.

[2] In the United States teachers earn 65 percent of what they could have earned in other career paths and 7 percent of them leave the profession every year according to statistics from the U.S. Department of Education http://nces.ed.gov/pubs2014/2014077.pdf. This number is consistent with the proportion of teachers who leave at both city and state levels. See, for instance, Staiger and Rockoff (2010) for evidence for Los Angeles and New York City, or Hanushek et al. (2004, 2016) for Texas.

[3] Dal Bó, Finan and Rossi (2013) provide recent evidence for the causal effect of increasing wages on the hiring of public sector employees. Higher wages attract more able applicants, as measured by IQ, personality traits, and proclivity towards public sector work. Distance and worse municipal characteristics strongly decrease acceptance rates, but higher wages contribute towards making these jobs more desirable.

[4] See Hanushek and Rivkin (2016) for a discussion on the net effect of turnover on quality of instruction.

[5] An alternative incentive scheme, in the tradition of the efficiency wage literature (e.g., MacLeod and Malcomson, 1998; and Shapiro and Stiglitz, 1984), is to offer a high wage and fire underperforming teachers. The likely impact on the flow of teachers and the productivity of teachers of these alternatives for the U.S. education system is discussed by Rothstein (2015) and Staiger and Rokoff (2010).

more accurate as their career evolves.[6] If higher ability types can signal their ability through observable measures of classroom performance at a relatively lower cost than low ability types, then schools can tie wages to this observable measure of classroom performance hoping that higher wages will reduce the turnover of good teachers. Yet, if the set of skills that are rewarded in any labor market are multidimensional and teaching ability is weakly correlated with the value of the skills that drives a worker's outside option, this policy may fail to significantly reduce quit behavior.

In this paper, we analyze the effects on teachers' retention and between-school mobility of a program that rewards teaching skills in Chilean primary and secondary public schools: the *Pedagogical Excellence Award*.[7] Chilean teachers apply voluntarily for the award, which is allocated on the basis of their pedagogical competence and knowledge of their field. Teachers must prepare a teaching portfolio and take a knowledge test.[8] The results of both assessments are combined in a final score. Those scoring above a certain threshold are awarded the equivalent of a 6-percent yearly wage increase for up to 10 years, as long as they remain in the public school system (regardless of the school). Thus, the program has two key aspects: i) it pays a bonus to more competent teachers, and ii) it provides an observable signal of teaching quality.

For the program to fulfill its role of reducing the rate at which teachers leave the schooling system not only the net wage gain has to be economically significant for teachers, but the probability of obtaining the award must be strongly correlated with the value of their outside option. A wealth of evidence, however, suggests that teachers' observable characteristics known to be rewarded outside teaching, are only weakly correlated with teaching proficiency (e.g., Hanushek and Rivkin, 2006; Rockoff et al., 2011). Therefore, whether rewarding teaching skills can contribute to increase retention is an empirical question. On the other hand, if the teaching

[6] See Rothstein (2015) for a thorough discussion of that model.

[7] We do not look at the effect on student outcomes as the data available for Chile does not enable us to do so. On this aspect, we rely on the existing evidence documenting a positive correlation between teacher credentials similar to the AEP award and teacher effectiveness (e.g., Clotfelter et al., 2006, 2007, 2010; Goldhaber and Anthony, 2007; Harris and Sass, 2009). The evidence on how the certification process on itself affects teacher effectiveness is mixed. While Clotfelter et al. (2006, 2007) and Goldhaber and Anthony (2007) document that the NBPTS program does not increase teacher effectiveness, Clotfelter, Ladd and Vigdor (2010) suggests it does. Taylor and Tyler (2012) suggests that the mere fact of undergoing an evaluation process improves teacher effectiveness. Dee and Wyckoff (2008) also document how incentive pay based on inputs developed in such evaluations can have long-lasting effects by increasing the attrition of low-quality workers and by incentivizing effort and developing skills among the remaining workers.

[8] The design of the program and allocation rule is similar to the National Board of Professional Teaching Standards (NBPTS) program (National Research Council, 2008).

award provides a signal of teaching ability that would not be available otherwise, it might boost mobility within the schooling system to the extent that there is a demand for good teachers and teachers are attracted to nonpecuniary aspects of a job.

We identify the causal effect of the program using a sharp regression discontinuity design on data of nine cohorts of applicants followed throughout the entire education system for five years. Our estimates indicate that locally the award does not alter transitions out of the public school system. Given the sizeable wage increase offered by the program, we interpret this finding as suggesting that around the threshold the skills rewarded by the program are not strongly correlated with the value of the teachers' outside option. We observe, however, an increase in mobility within the public school system among teachers that receive the award. Such movements are consistent with the award providing a signal of teaching quality that was not yet available to the market. Specifically, the award induces a boost in between-school transitions in markets with more opportunities for mobility and, within these markets, awardees are more likely to move to schools with high student performance.

This paper speaks to a large literature in personnel economics that studies the effects of wages on recruitment, retention and motivation in the private sector (e.g., see Lazear and Oyer, 2012 for a survey), public sector (e.g., see Finan, Olken and Pande, 2015, for a survey) and in education (e.g., Neal, 2011). The empirical literature focuses, primarily, on the effect of rewarding some measure of output performance on worker productivity.[9] Fewer papers look at the effects on productivity of rewarding workers on input measures, with some notable exceptions in the educational literature (e.g., Clotfelter et al., 2006 and 2007; Duflo, Hanna and Ryan, 2012; Goldhaber, Choi and Cramer, 2007; Goldhaber and Anthony, 2007).

More closely, a set of papers address the issue of how to compensate public sector workers in developing countries (e.g., Dal Bó et al., 2013; de Ree et al., 2018). Within this literature, we raise an important point and it is that the outside option of these workers might not be associated

[9] In the private sector, the classic example of Lazear (2000) shows that the introduction of a piece wage rate—as opposed to a fixed wage rate—increases effort and generates sorting with less productive workers leaving the firm. In education, the responses of teacher effort to incentive pay are mixed. In developing countries, Lavy (2002, 2009) and Muralidharan and Sundararaman (2011) find that paying teachers according to how their students perform improves student achievement; although using the same measure to assess students and teachers might lead to cheating and teaching to the test (Glewwe, Ilias and Kremer, 2010). In the United States, Figlio and Kenny (2007) find that even small financial incentives have a positive effect on student achievement; while Goodman and Turner (2013), Fryer (2013), and Springer et al. (2012) find little or no short-term effects of incentive pay.

with what make workers good civil servants. As a result, providing incentive pay based on quality or on how mission-driven an individual is might not contribute to increase retention among motivated workers (Besley and Ghatak, 2005).

Methodologically, our paper is closer to the analysis in Goldhaber and Hansen (2009) for North Carolina, where they study the effects of the National Board of Professional Teaching Standards (NBPTS) certification on teacher's career paths. Similar to our setting, the state of North Carolina covers the full cost of the assessment and rewards certified teachers with a 12 percent salary increase. Their findings suggest that NBPTS certified teachers are more likely to leave North Carolina's public-school system than unsuccessful applicants and exits are concentrated in high minority schools. The authors, however, cannot distinguish between permanent exits from teaching and movements towards other states school system. This is a relevant question as the monetary compensation to NBPTS certified teachers differs across states. In our setting, we not only observe movements throughout the entire education system, but also isolate teachers' preference for jobs with certain characteristics from schools' ability to attract better workers through higher wages.

Finally, we contribute to the literature on the effects of skill-based compensation on worker turnover. We are able to separate the exit decisions associated with higher pay from the mobility decisions that might be induced by the award as a signal of quality.[10] We can do so because the bonus is paid by the government, independently of the school. Advocates of incentive pay and targeted pay in education promote its introduction on the claim that it can raise educational outcomes. However, if incentive pay leads to the reallocation of workers from schools with poorer results to schools with better results, these incentives may lead to undesirable inequities.[11,12,13]

[10] The underlying assumption is that the income effect on mobility is negligible.

[11] Surprisingly, this is seldom studied in the education literature. An exception is Guarino, Brown and Wyse (2011) who find that school-based pay-for-performance is associated with teachers' mobility decisions and may exacerbate inequality in North Carolina.

[12] Our paper is also related to the literature on teacher licensing (see, Angrist and Guryan, 2004 and 2008; Hanushek and Rivkin, 2010; Wiswall, 2007; Kane, Rockoff and Staiger, 2008; and Harris and Sass, 2009). Compulsory licensing or certification imposes a barrier to entry, which reduces the supply of labor and increases labor costs. The program we study, however, is voluntary and does not affect ex ante entry costs.

[13] Several papers document that certified teachers teach in schools with higher performing students (e.g., Clotfelter et al., 2006 and 2007; Goldhaber, Choi and Cramer, 2007; and Goldhaber and Anthony, 2007). The evidence, however, does not distinguish on whether the sorting occurs on the basis of quality (regardless of the existence of the certification) or is induced by the certification itself.

The rest of the paper is organized as follows. In Section 2 we provide some background on the Chilean education system and the design of the program. Section 3 describes the data used. In Section 4 we present our identification strategy. In Section 5 we present our results. Section 6 concludes.

2. Background

Primary and secondary education in Chile is provided by three types of institutions: municipal or public schools, private-subsidized schools, and private schools. Municipal schools are non-profit institutions that offer instruction to students for free. They receive a per-student subsidy from the Ministry of Education and are administered by municipalities. Private schools are for-profit institutions that charge tuition to students. They receive no subsidies from the government and are administered as private corporations. Private-subsidized schools are run like private schools, receiving the same per-student subsidy as municipal schools, and they can also charge tuition (Mizala and Urquiola, 2013; and Mizala and Schneider, 2014).[14] We refer to municipal and private-subsidized schools as the voucher school system. In 2010, for instance, 93 percent of children enrolled in primary and secondary schools attended a municipal school (42 percent) or a private-subsidized school (51 percent).[15]

The contractual arrangements for teachers are different in the three types of providers. The employment of teachers in municipal schools follows a teacher statute negotiated by the union. In the private sector, employment follows the standards established by common labor law. Employment of teachers in private-subsidized schools retains some aspects of the municipal school and the private school system (Mizala and Romaguera, 2005; and Santiago et al., 2013).[16]

Wages in the private sector are uniformly higher. Younger teachers have higher wages in private-subsidized schools than in the municipal schools, yet wages increase faster in the municipal sector. The level of wages practically equalizes for the 41-50 age group. After this age, municipal

[14] The fees that private-subsidized schools can charge to students are regulated.

[15] During the 2004-2013 period, however, there have been compositional changes between municipal and private-subsidized schools. In 2004, 50.4 percent of the students were enrolled in municipal schools; while in 2013, only 39 percent were.

[16] For example, minimum wages, bonuses, and maximum working hours are determined by the Teachers Statute. Yet after reaching the retirement age (60 years for women and 65 for men) teachers are no longer allowed to teach in municipal schools, but they can still teach in private-subsidized institutions.

school teachers are paid a higher per hour wage rate than at private-subsidized schools (Bravo, Flack and Peirano, 2008).

In 2015 the statutory salary of a typical primary or secondary school teacher in Chile was around 28,000 USD; less than two-thirds (61 percent) of what similarly educated workers in other occupations make (OECD, 2017). Not surprisingly, there is considerable teacher turnover. In Table 1, we look at the transitions of the universe of 314,665 voucher school system teachers who are not of retirement age during the 2003-2016 period. Eighty-two percent of teachers employed at time t remain at the same school at $t+1$. This means that 18 percent of the contractual relationships between schools and teachers end in a given year: 11 percent of teachers change school and 7 percent leave the voucher school system.[17,18] Among the teachers that are inactive at time *t*, 89 percent remain inactive the following period, and 11 percent go back to teaching. Hence, teachers who leave the voucher school system are unlikely to return.[19] Overall, a teacher that was active at some point in 2003-2016 has a 66 percent chance of remaining in the same school a year after, an 11 percent chance of being in another school and a 23 percent chance of being out of the voucher school system.

Like in most work careers, turnover among teachers is higher earlier on.[20] In Table 2, we focus at transitions over the first five-years for teachers that started working between 2003 and 2011. One year after entering the profession, 62 percent of teachers remain at the same school, 18 percent change school, and 20 percent are out of the school system.[21] By the end of the fifth year, one out every four new teachers has left the voucher system.

[17] In addition to the 7 percent exit rate, on average, every year about 0.5 percent of teachers retire.

[18] This figure is similar to the United States. Hanushek and Rivkin (2016) find that, on average, 80 percent of the teachers in the Lone Star District during 1997 and 2001 stay at the same school; 6 percent exit the Texas public school system, and the remaining 14 percent change either school or district. Similar numbers are found in Hanushek, Kain and Rivkin (2004) and Hanushek and Rivkin (2010). Staiger and Rockoff (2010) adopt a similar 5 percent turnover rate for their simulations, under the claim that this is the average proportion of experienced teachers who leave the Los Angeles and New York City districts each year. Based on data from the 1999-2000 Schools and Staffing Survey, Rothstein (2015) adopts an 8 percent annual exit rate.

[19] We have separated these transitions for men and women, and there are no important differences to report (see the online Appendix, Table B1).

[20] For instance, Ballou and Podgursky (2002) suggest that their 65 percent estimated retention rate for teachers with less than two years of experience resembles the 62 percent retention rate professional/managerial workers with similar experience.

[21] Comparisons between females and males suggest that 30 percent of male teachers leave the schools system by the 5th year versus 23 percent for females (see the online Appendix, Table B2).

To the extent that bad matches are broken, turnover can be beneficial for both workers and firms. However, teachers may lose the return to human capital when separations occur, and schools incur losses in the form of hiring and training costs (Hanushek and Rivkin, 2016). Therefore, uncertainty about the length of the employment relationships and imperfect labor markers may lead to underinvestment in specific human capital (see, for example, Hashimoto, 1981, and Stevens, 1994).

In response to high levels of teacher turnover and the perception that many good teachers were leaving the profession (Araya-Ramírez et al., 2012), in 2002 the Chilean government introduced a voluntary award program designed to reward excellence in teaching, both economically and socially. The Pedagogical Excellence Award—*Asignación a la Excelencia Pedagógica* or AEP (following its Spanish acronym)—was created to recognize teachers in municipal and private-subsidized schools for their subject knowledge, course curricular content, didactic skills and classroom competence.

Voucher school teachers working for at least 20 hours a week can apply for the AEP. Applicants must prepare a teaching portfolio and take a written test in their main area of expertise. In the portfolio, teachers demonstrate their teaching practices. This assessment requires a learning plan for the students, an evaluation strategy, a pedagogical reflection and a recording of a class. In the written test, teachers are evaluated on grounds of their subject and pedagogical knowledge.[22] The results of these two assessments are combined in a final score ranging from 100 to 400. For the AEP rounds taking place until 2011, the final score was a weighted average, with 70 percent of the weight given to the portfolio and 30 percent to the written test.[23]

Only teachers with a final score of at least 275 receive the award.[24] In Table 3, we present the number of applicants and the percentage that received the award between 2003 and 2011. During this period, there were 14,562 applications, with a pass rate of 25 percent. The passing rate, however, varies over time. While 44 percent of the 2003 applicants received the award, less than

[22] These assessments are similar to those of the National Board of Professional Teaching Standards (NBPTS) certification process. The existing evidence documents a positive correlation between the NBPTS certification and teacher effectiveness (Clotfelter et al., 2006, 2007, and 2010); Goldhaber and Anthony, 2007; Harris and Sass, 2009).
[23] The design and the grading of the assessment are undertaken by an independent third party contracted by the Ministry of Education.
[24] This cut-off point was identified by inspecting the data and was confirmed by the *Centro de Perfeccionamiento, Experimentación e Investigaciones Pedagógicas* (CPEIP) in internal correspondence. To our knowledge, there is no official document where the threshold is stated.

20 percent did so after 2007. Regardless of this trend, none of the AEP awardees scored below 275.[25]

AEP awardees receive a monetary bonus which, on average, is equivalent to a 6 percent annual salary increase.[26] Teachers receive this bonus if they are working for a minimum of 20 hours a week in the voucher school system, and the entitlement lasts for up to 10 years.[27] As part of the social recognition component, the awards are presented in a ceremony with local authorities and media coverage. Awardees are also invited to become mentors of other teachers in the Network of Teachers of Teachers (*Red Maestro de Maestros*).

The application process for the AEP begins in April. The portfolio is prepared from July to October, and the written examination takes place in November. The school year starts in March and teachers learn about their score and passing status in April.[28] Those who are successful receive the first installment in July. Afterwards, payments are made twice a year. We present this time line in Figure 1.

Aside from the AEP, there are other incentive mechanisms built into the Chilean education system. Municipal school teachers can also apply for an individual performance award called *Asignación Variable al Desempeño Individual* or AVDI (following its Spanish acronym). Teachers can receive both the AEP and the AVDI award and can apply to them simultaneously (although not many do). There is also, the National System for Performance Evaluation—*Sistema Nacional de Evaluación del Desempeño*) or SNED (following its Spanish acronym)—that introduces a collective performance incentive. In a given geographical region and within school types the program groups schools in clusters with similar students' socioeconomic characteristics. Within these clusters, it ranks schools every two years according to six sub-indexes which include, for example, student performance in standardized tests and working conditions.[29] All the teachers in

[25] Until 2006, the Ministry of Education also fixed regional quotas. Awards were meant to be allocated to teachers, ordered by their final score, up to the quota. However, since the application rate was low, the quotas were never binding.

[26] AEP bonus is equivalent to 70 percent of a monthly salary. The magnitude of the bonus varies at four levels of experience: 0-11 years, 12-21 years, 22-30 years, and 31 plus years. Teachers can apply for an award only twice within each of these levels and must reapply when transiting across them if they want to be payed the higher rate.

[27] After 2011, the AEP award period was reduced to four years.

[28] Although teachers are informed of their score and performance, no material is returned to the applicants.

[29] There are six SNED sub-indexes: effectiveness, improvement, equality, participation, initiative, and working conditions. Effectiveness refers to 4^{th}, 8^{th} and 10^{th} grade students' standardized tests' scores, in levels. *Improvement* refers to inter-cohort student gains. Equality captures repetition and dropout rates, discriminatory practices, and integration of physically challenged students. Initiative captures school educational activities. Participation refers to parental participation and parents' perception of the quality of the school. Working conditions captures schools

the best ranked schools in each cluster receive an annual bonus equivalent to 50-70 percent of a teacher's monthly salary (Mizala and Urquiola, 2013).

3. Data

We use administrative data for the universe of teachers in the school system published yearly by the Ministry of Education. The dataset is available from 2003 and contains information on basic demographics, educational qualifications, experience, and place and hours of work for all active teachers as of June 30 of each year. We match these records with the scores and award status of individual applicants to AEP and with school-level data from SNED.

In Table 4, we describe how we build our estimation sample. We start with 14,562 teachers who applied for the AEP between 2003 and 2011, and we concentrate on the 12,797 first-time applicants.[30] Further, we restrict our focus to individuals who applied for an award as primary or secondary school teachers.[31] We match these data with the administrative records and restrict our analysis to individuals who, at the time of application, were at least four years away from retirement age (i.e., 56 for females and 61 for males). We then focus on the sample of teachers who are not concurrently applying to AVDI. Finally, we drop 47 observations for teachers who scored 275 but are not classified as receiving the award. This gives us a sample of 8,633 applicants.

In the first column of Table 5, we present average information for all employed teachers in the voucher school system during the 2003-2011 period. In the second column, we present analogous information for those who have applied for the AEP, at the time of application. In the third and fourth columns, we present the same descriptive statistics at different points of the distribution of the AEP score. In the fifth column, we present the estimated coefficients of an Ordinary Least Squares regression of the AEP score on the descriptive variables for the sample of AEP applicants at the time of application.

Beginning with basic demographic and qualification variables, we observe that over the 2003-2011 period, the average Chilean teacher is a 41-year-old woman with a degree in education and 18 years of teaching experience. Teachers work, on average, for 38 hours a week, and around

placement in a survey from the Ministry of Education. Further description of the content of the SNED sub-index can be found in Mizala and Urquiola (2013).

[30] We eliminate 2002 AEP applicants because of lack of administrative data.

[31] We eliminate those applying for the award in pre-primary education, adult education and special education as they face radically different inside and outside options than teachers in primary and secondary schools.

12 percent of them work in more than one school. Fifty-seven percent of teachers work as primary school teachers, 45 percent work at private-subsidized schools, and 30 percent work at a SNED-awarded school. One third of the teachers work at schools located in the Santiago metropolitan area, and 14 percent work at schools located in rural areas. Relative to the average voucher school system teacher, at the time of application AEP candidates are younger, more likely to have a degree in education, and more likely to work at a private-subsidized school and in a SNED-awarded school.

In the third and fourth columns of Table 5, we present average teachers' characteristics around the discontinuity threshold (275). As can be seen from the sample size, a large mass of AEP applicants (93 percent) scores between 200 and 349 points. The gender, years of experience, number of contracted hours, number of schools where working at, as well as the percentage of teachers working in subsidized-private schools, the percentage of teachers working in the Santiago metropolitan region, and the rurality of the school are relatively similar for teachers scoring between 200 and 274 and those scoring between 275 and 349. There is suggestive evidence, however, that the score is negatively correlated with the age, and positively correlated with having a degree in education, being a primary school teacher and working at a SNED-awarded school. This intuition is confirmed in column five. Ceteris paribus, being one year younger is associated with an additional point in the AEP score; a degree in education is associated with five additional points; being a primary school teacher is associated with two additional points, and teachers from SNED-awarded schools score about three more points.

In Table 6, we present the transitions of the AEP applicants up to five years after they applied to the program. At the time of application, 87 percent of the AEP applicants are at the same school as they were in the previous year. The rest are new at their current school. One year after they applied to the program, 88 percent remain at the same school, 8 percent move to a new school, and the rest move out of the school system. Five years after application, 9 percent of the AEP applicants are new at the school, and 13 percent are out of the school system. This increase over time in the percentage of teachers leaving the school system captures the fact that, once a teacher moves out of teaching, she is more likely to stay out of teaching than to come back.

In the second and third panel of Table 6, we present a naive comparison between the transitions of applicants who scored 275 or above with those who did not. The mobility patterns differ slightly between awardees and non-awardees. While 2 percent of AEP awardees move out

the school system one year after application, 3 percent of non-awardees move out. This one percentage point difference persists over time. The relationship, however, is not causal. In the following section we formally address the causal effect of the AEP award on teachers' transition out of the school system and between-school mobility.

4. Empirical Strategy

The AEP award status is a deterministic function of an applicant aggregate score. Yet, as presented in column five of Table 5, this measure of teacher performance is associated with other potential determinants of teacher behavior. Thereby, if we want to study the causal impact of the award on teacher retention and mobility, a naive comparison of the outcomes of awardees versus non-awardees as done in Table 6 will provide biased and inconsistent estimates of these effects.

We tackle the issue of causality using a sharp regression-discontinuity design. In it, we exploit the discontinuity in the allocation of the award around the 275 threshold. In the absence of manipulation around this cut-off, teachers who scored 275 should be similar to those who scored 274.[32] Therefore, if we observe any systematic difference in behavior around the threshold after the award is granted, we can attribute it to the program.

We implement the regression discontinuity design using the following estimating equation:

$$(1) \qquad y_{i\tau} = \alpha + \beta D_{i\tau} + \gamma_\tau f(x_{i\tau} - 275) + \delta_\tau D_{i\tau} f(x_{i\tau} - 275) + \lambda_\tau + \varepsilon_{i\tau},$$

for all $x_{i\tau} \in (275 - h, 275 + h)$. That is to say, the outcome variable $y_{i\tau}$ for a teacher i who applied for the program at wave τ is a function of a constant α; a dummy $D_{i\tau}$ which takes the value of 1 if the teacher scored at least 275 and 0 otherwise; a suitable polynomial function of the score centered on the discontinuity cut-off, $f(x_{i\tau} - 275)$ and varying at both sides of the cut-off; and a set of wave fixed effects λ_τ. We estimate equation (1) using the optimal bandwidth, h, of Calonico, Cattaneo and Titiunik (2014b) and a local non-parametric approach with a triangular

[32] See Hahn, Todd, and Van der Klaauw (2001) and Lee (2008) for an interpretation of the regression discontinuity approach as a local randomization.

kernel and a first order polynomial of the score.[33] The standard errors are robust corrected, as prescribed in Calonico, Cattaneo and Titiunik (2014a).[34]

We are interested in the parameter β. Under suitable assumptions, β provides a local measure of the causal impact of obtaining the AEP award. The basic identifying assumption is that there is no systematic manipulation of the running variable around the threshold. There are at least two strategies for exploring the plausibility of this assumption (see, for example, Lee and Lemieux, 2010). First, there should be no kinks in the density of the score around the discontinuity. Second, predetermined factors ought to vary smoothly around the 275 cut-off.

In Figure 2, we plot the histogram of the final score for the pooled sample of applicants. There is no visual evidence of kinks in the density of the score around the 275 threshold. In Table 7, we formally test the no discontinuity hypothesis and present the p-values of the Calonico, Cattaneo and Titiunik (2014a) test, the Frandsen (2017) test for variables with discrete support and the conventional McCrary (2008) test. In column one we present the results for the pooled sample. In the remaining columns we present the results for each application wave. For the 2004, 2007 and 2009 waves, there is some evidence of discontinuity. Yet there is not a single application wave for which the three tests provide conclusive evidence of a discontinuity of the density. Pooling all applications waves together, we cannot reject the null hypothesis of no discontinuity.

In Table 8, we provide evidence on the continuity of predetermined covariates around the threshold using as outcome variables the characteristics of the teachers and their corresponding schools at the time of application. When estimating equation (1), for each outcome variable we use the specific optimal bandwidth (see, Calonico, Cattaneo and Titiunik et al., 2014b). None of our 11 predetermined covariates exhibit a statistically significant difference around the threshold.

As an additional test of the validity of the design, we use the predetermined covariates to predict our main outcomes of interest: transitions out of the voucher school system and between-school mobility. To so do, we estimate a logit model of whether or not the teacher moved out of the voucher school system at any point during the five years following the application to AEP,

[33] We have also estimated equation (1) with a parametric approach, where we control for a piece-wise second order polynomial of the score and cluster standard errors by score integer bins. The results tend to be similar than in the parametric approach and are available from the authors upon request.

[34] Lee and Card (2008) show that one can interpret the deviation between the true conditional expectation function and the estimated regression function as random specification error that introduces a group structure into the standard errors for the estimated treatment effect. In practice, we first collapse the data at the score-wave level; then we estimate equation (1), weighting by the number of observations within each score-wave bin.

using as explanatory variables the predetermined characteristics in Table 8 and a battery of wave fixed effects. We repeat the analogous exercise for between school mobility using as left-hand-side variable a dummy that takes the value of 1 if the teacher moved to a new school at any point during the five years following the application to the program, and 0 otherwise. With these two models we predict the probability of being out of the school system and the probability of moving to a new school.

In Figures 3 and 4, we plot the mean values of the predicted probabilities at each score cell bin. The visual evidence suggests that neither the predicted transitions out of the voucher system nor the predicted mobility are discontinuous around the 275 threshold. This intuition is confirmed by Table 9. On average, 19 percent of the AEP applicants moved out of the voucher school system at some point during the five years following the application; yet, conditional on the score, the award status is not correlated with the predicted probability of leaving the school system. Something similar occurs with between-school mobility. On average, 32 percent of the AEP applicants moved to a new school at some point during the five years following the application to the program; yet, conditional on the score, the award status is orthogonal to the mobility patterns predicted by predetermined teacher characteristics. Overall, the evidence suggests that there is no manipulation of the score around the threshold.

5. Main Results

The main goal of the Pedagogical Excellence Award initiative is to identify good teachers, prevent them from leaving the system, and allocate them where they are needed the most (Araya-Ramírez et al., 2012). For this purpose, the program provides AEP awardees with monetary incentives and a social recognition component that are expected to affect their separation decision.

Consider an individual who at time t is teaching in school s. She must decide whether to continue teaching next period $(t+1)$ or quit teaching and take her outside option.[35] If she continues teaching, she also decides whether to stay at school s or move elsewhere. For simplicity, assume that a teacher who leaves teaching system does not return.[36]

At every juncture, a teacher's decision is driven by the comparison of three streams of utility: i) the present value of staying in school s at $t+1$ and any continuation value that this

[35] The underlying assumption is that offers from teaching and non-teaching jobs arrive in every period.
[36] This assumption is also supported by the descriptive evidence presented in Section 3.

decision may have, ii) the present value of moving to a different school at $t+1$ and any continuation value that this decision may have, and iii) the present value of moving out of teaching.

Net of the monetary and psychic costs of preparing for the assessment, the award program increases the monetary value of teaching anywhere in the voucher school system. Therefore, it increases the stream of utility from teaching for anybody who passes the exam and obtains the award and makes teaching more attractive in relation to the outside option. The key question is whether this stream of utility is large enough to dissuade the marginal teacher from quitting.

Because application for the award is voluntary, the extent to which the bonus will affect the decision to stay or leave a career in teaching will depend on who self-selects to take the exam. Suppose that workers have a noisy private signal of their ability that becomes more accurate as their career evolves and that higher ability types are more likely to receive the award. If, at the margin of variation of our identification strategy, teaching ability is not strongly correlated with the value of the set of skills rewarded in other labor markets, the monetary incentives associated with AEP award may fail to reduce quit behavior. At the end of the day, it is an empirical question whether, given the costs of preparing for the assessment, the probability of passing the exam and the size of the bonus, this program can affect teachers' decision to stay in the profession.

Awardees receive a wage increase regardless of the school where they are employed as long as it is within the voucher school system. If the award provides an otherwise unobservable signal of teaching quality, school administrators at establishments for which there is excess demand can use the award to screen teachers. This, in turn, will allow awardees to obtain jobs with more desirable characteristics.[37] If there is a common ranking of postings, we speculate that student performance and working conditions are prime drivers.[38] If there is an idiosyncratic ranking of postings, commuting time would be a prime driver.[39]

We now look at the effect of the award on teacher retention and between school mobility.

[37] One can also think about the ability to reallocate to more desirable jobs could act as an additional incentive device.
[38] We proxy student performance and working conditions using the SNED status of the school. We also explore for the specific sub-indexes of the SNED. The results are available from the authors upon request.
[39] Even if we have information about the school location, we do not have information about teachers' place of residence.

5.1 Teacher Retention

We begin our analysis by looking at the effect of receiving an AEP award on teachers' transition out of the voucher school system. In Figure 5, we summarize the relationship between the AEP aggregate score and whether or not a teacher has a spell out of the voucher school system at any point during the five years following the application to the program. The circles represent the un-adjusted mean of this variable within bins of the score. The solid line represents the 275 cut-off. There is no visual evidence of breaks around the cut-off.

In Table 10, we present the results of estimating equation (1) for teachers' transitions out of the voucher school system. We use three different measures to capture them: i) a dummy equal to one if a teacher moved out of the voucher school system at any point during the five years following application to the program (first row); ii) the number of years out of the voucher school system in the five years following the application to the program (second row); and iii) a dummy equal to one if a teacher moved out of the voucher school system at any point during the first two years.[40] The estimates in any of the three rows present the same picture: the impact of receiving an award is small and non-statistically significant. Thus, locally, getting an AEP award does not affect transitions out of the voucher school system.[41,42]

We investigate next whether these null results hide some potential heterogeneity among groups which may have different outside options or for which the award status may reveal different information to the market. In Table 11, we replicate Table 10 for males and females, separately, and in Table 12 for three different experience groups: one to five years, six to 15 years, more than 15 years. The results do not reveal heterogeneous effects on transitions out of the voucher school systems, confirming the lack of local impact of the program on teacher retention.

5.2 Between-School Mobility

We now ask whether the award led to any changes in the way teachers sort between schools. Due to the selective nature of the award process, the AEP can provide a signal of teaching quality and

[40] The AEP status is announced in April of the year following the examination; the employment status is collected as of June. Therefore, the first two-years represent around 14 months since the announcement of the results.
[41] In Table A1, we rule out the presence of transitions from the voucher school system to the private sector.
[42] The education literature suggests a teacher separation elasticity ranging from -1 to -3.5 (Dolton and Van der Klaauw, 1995 and 1999; Clotfelter et al., 2008; Falch, 2011). Our results imply zero exit elasticity. This figure is not necessarily at odds with the existing evidence as our results are driven by the self-selective nature of the program.

those receiving the award may use it to improve the overall deal they get from working in the school system. Hence, we are interested in whether teachers move to a new school after receiving an award.

In Figure 6, we look for breaks in teachers' mobility at any point in the five years following the examination. Teachers receiving the award seem to have higher chances of moving to a new school during this time span. The third row of Table 13 confirms this insight.[43] Awardees are 0.061 percentage points more likely to move to a new school in the first 14 months after receiving the award. With 16 percent of the teachers changing schools at least once during this time interval the point estimate implies that the AEP award contributes towards more than a third of the mobility observed between schools in the voucher system.[44] The impact on the longer five-year span indicator, first row, is similar to the short one, which suggests that most transitions occur soon after obtaining the award. In Tables 14 and 15, we investigate the characteristics of teachers moving within the voucher school system: the evidence suggest that most of the between-school mobility is concentrated among the most experienced workers.

If the award is increasing teacher mobility across the voucher school system, which are the jobs aspects that attract teachers the most? If there is a common ranking of postings, we speculate that student performance and working conditions are prime drivers.[45] In Table 16, we look at school characteristics rewarded by SNED as potential drivers of teachers' mobility as some of these characteristics have been found relevant for teacher mobility in similar contexts (e.g., Hanushek, Kain and Rivkin, 2004). We classify schools according to their average relative performance in each of the SNED components during the 2000-2016 period. First, within the homogenous groups, we standardize the schools' score in each of the six sub-indexes of SNED. Then, we classify schools according to their average standardized sub-index during the period 2000-2016. *High* type schools are those with an average relative performance above the median. Table 16 reveals that, within groups of schools with similar student socioeconomic characteristics, AEP awardees are

[43] The computation of the variables in Tables 13-17 includes—as zeros—the teachers that have transitioned out of the voucher school system. Tables A2-A6 present the analogous results only for teachers active in the voucher school system.

[44] Such mobility rates would imply an elasticity of 2.8. However, as mobility is driven by the signal of quality rather than by the increase in wages—which is homogenous across all voucher system schools—this this figure cannot be interpreted as an elasticity.

[45] If there is an idiosyncratic ranking of postings, commuting time would be a prime driver. Yet even if we have information about the school location, we do not have information about teachers' place of residence.

0.093 percentage points (13 percent) more likely to move to schools with high student performance.[46]

In Table 17 we investigate whether there are specific schools or areas that experience higher teacher mobility linked to the AEP program. In other words, what type of schools or areas are teachers moving from? To answer the question, we contrast the effect of the AEP by the characteristics of the schools at the time of application: private-subsidized, municipal, SNED-awarded, non-SNED-awarded schools, Santiago metropolitan region, other regions, rural and urban. The estimates reveal a clear message: the impact of receiving an award on mobility across the voucher school system is driven by individuals working in municipal schools, non-SNED awarded schools, schools located in the Santiago region or urban schools. Interestingly, all of the relevant characteristics for mobility presume the existence of a market with a demand for good teachers.[47]

Given that teachers are driven to schools with better student performance, a final question ensue: to what schools or areas are these teachers going? In Tables 18 to 21 we explore the effects of AEP on the school of destination by characteristics of school or markets of origin.[48] Consistent with Table 17, the evidence in Table 19 suggests that AEP awardees teaching at non-SNED-awarded schools are moving towards SNED awarded schools. Yet, even if teachers are moving at higher rate from municipal schools they are not more likely to move towards private-subsidized schools (nor to leave the voucher school system) because of the AEP award. Together with the previous findings, this suggests that the AEP program induces a boost in between school transitions in markets with more opportunities for mobility, and within those markets, teachers rank postings according to student performance.

[46] We perform a similar analysis, classifying schools according to their absolute average performance in each on the sub-indexes of SNED. We believe that classification is not necessarily informative for job-posting characteristics, as it compares schools from different geographical areas. See Appendix Table A5.

[47] We define a market at the commune level, which is the legal definition for municipal schools. For each commune in Chile, we construct an indicator of the average teaching vacancies per year during the 2003-2013 period. We then use this measure to categorize communes by market size. We classify as communes with high number of vacancies as the above the 75th percentile of the teaching vacancies distribution. Not surprisingly, voucher schools, non-SNED-awarded schools, Santiago metropolitan region schools, and urban schools are located in high-vacancy communes.

[48] See Tables A7-A10 for the entire range of heterogeneous effects by school of origin.

6. Conclusion

School systems around the world are daunted by the task of hiring and retaining good teachers for their classrooms. We analyze the effects on retention and between school mobility of a program that rewards excellence in pedagogical practice in Chile. Teachers apply voluntarily for the award and those who succeed on a set of assessments receive a six percent annual wage increase for up to 10 years.

We use a sharp regression discontinuity design to identify the causal effect of receiving an award for primary and secondary school teachers. Using administrative data over nine cohorts of applicants, our estimates indicate that locally the award does not alter transitions out of the school system. This suggests that around the threshold the skills rewarded by the program are not strongly correlated with the value of the teachers' outside option.

We observe, however, an increase in mobility within the public school system among teachers that receive the award. Such movements are consistent with the award providing a signal of teaching quality that was not yet available to the market. Specifically, the award induces a boost in between-school transitions in markets with more opportunities for mobility, independently of other observable school characteristics, and within these markets, teachers rank higher job postings at schools with high-performing students.

Advocates of incentive pay and targeted pay in education promote its introduction on the claim that it can raise educational outcomes. However, if incentive pay leads to the reallocation of workers from schools with poorer results to schools with better results, these incentives may lead to undesirable inequities. Therefore, both researchers and policymakers ought to take a closer look at the design of reward program and their effects on worker mobility.

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Figures

Figure 1. Timeline

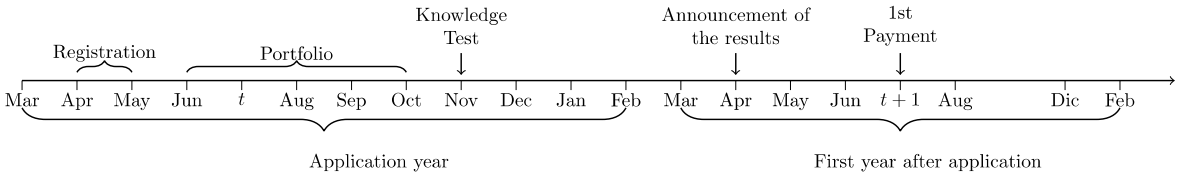


Figure 2. Frequency Distribution of the Score

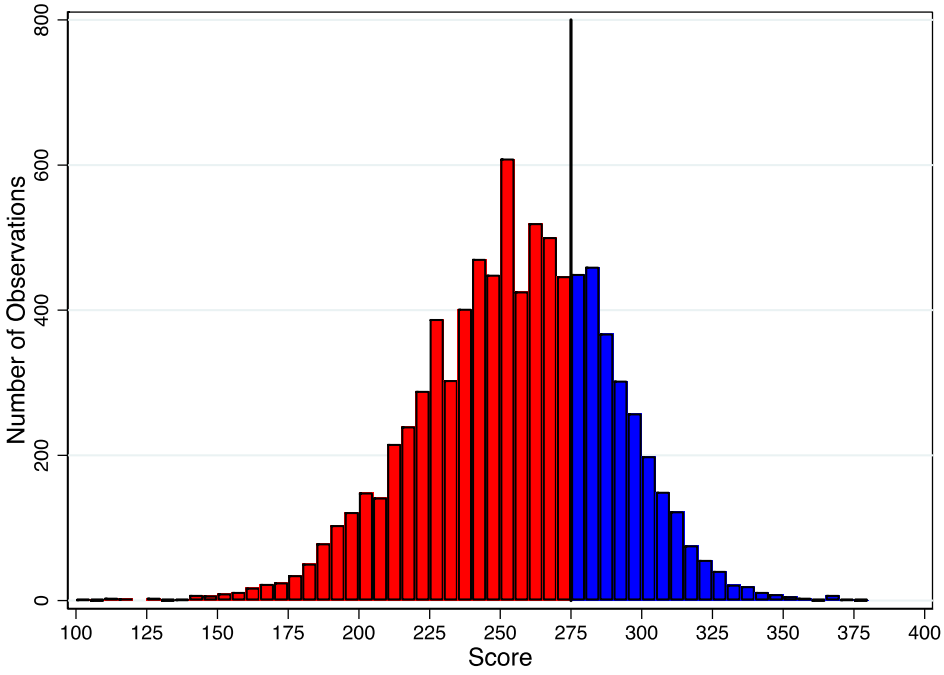
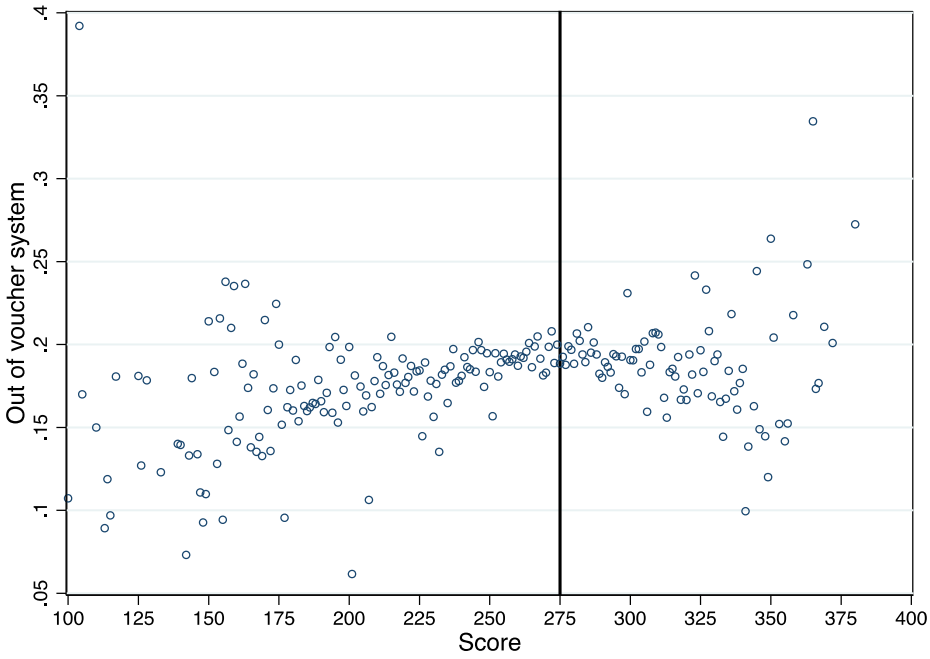
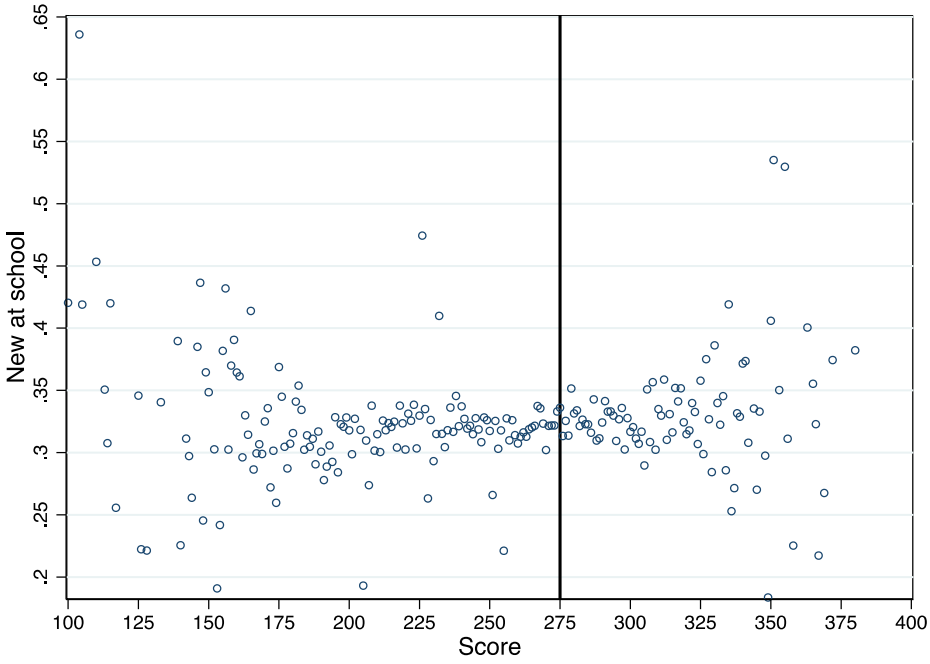


Figure 3. Predicted Teachers' Transitions out of the School System



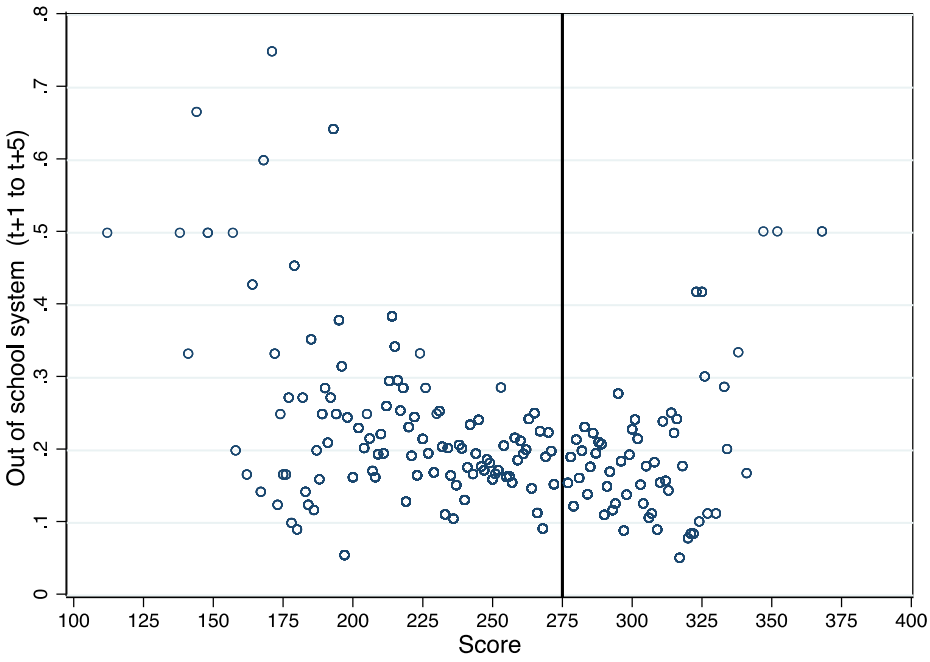
Notes: The circles represent the score cell average of the predicted probability of being out of the school system at any point during the four years following the application to AEP, using a logit model with predetermined covariates and application wave fixed effect as regressors.

Figure 4. Predicted Teachers' Mobility within the Voucher School System



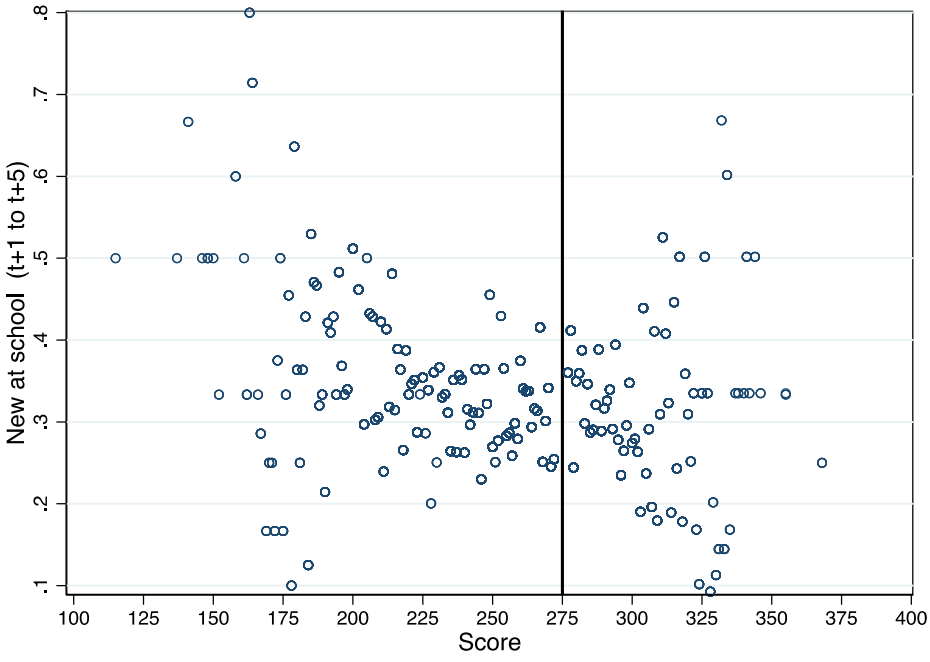
Notes: The circles represent the score cell average of the predicted probability of being out of the school system at any point during the four years following the application to AEP, using a logit model with predetermined covariates and application wave fixed effect as regressors.

Figure 5. Effect of AEP on Teachers' Mobility within the Voucher School System



Notes: The circles represent the score cell average of the number of teacher who are out of the school system at any point during the four years following application to AEP.

Figure 6. Effect of AEP on Teachers' Mobility in the Voucher School System



Notes: The circles represent the score cell average of the number of teacher who are new at a school at any point during the four years following application to AEP.

Tables

Table 1. Teacher Turnover in Chile

	2003-2016 Teachers		
	Active (t)	Not Active (t)	All
Same school ($t+1$)	0.817	0.000	0.659
New at school ($t+1$)	0.108	0.111	0.109
Out ($t+1$)	0.074	0.889	0.232

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sample of 2003-2016 voucher school teachers. Transitions from t to $t+1$ observe at $t+1$. At every time t a teacher can stay at the same school, change from school, or move out of the voucher school system. A teacher that is out of the voucher system at t and returns to teaching at $t+1$ is considered as a change of school.

Table 2. Teacher Turnover Early in Career

	Years after Entry				
	1	2	3	4	5
Same school	0.615	0.570	0.596	0.603	0.600
New at school	0.184	0.212	0.179	0.162	0.152
Out	0.200	0.217	0.225	0.236	0.248

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sample of teachers who entered the career between 2003 and 2010. Transitions from t to $t+1$ observe at $t+1$. At every time t a teacher can stay at the same school, change from school, or move out of the voucher school system. A teacher that is out of the voucher system at t and returns to teaching at $t+1$ is considered as new at a school.

Table 3. Proportion of Applicants Receiving the AEP Award over Time

	All	2003	2004	2005	2006	2007	2008	2009	2010	2011
AEP Awardees	25.4	43.7	32.2	34.5	28.3	20.5	19.0	17.6	17.2	20.7
Scored <275 and AEP awarded	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	14,562	935	1,621	1,834	2,215	1,666	1,661	1,815	1,499	1,316

Source: Authors' calculations based on data from the Ministry of Education (Chile).

Table 4. Estimation Sample

Criteria	Sample size
AEP applicants 2003-2011	14,562
First time applicants	12,797
Certified in primary or secondary education	11,180
With complete administrative record	9,888
At least 4 years before retirement	9,813
Not applying for AVDI simultaneously	8,680
Compliers with the AEP allocation rule	8,633

Notes: 2002 AEP applicants are eliminated due to lack of administrative data.

Table 5. Descriptive Statistics

	2003-2011 Teachers	AEP applicants at t	AEP Applicants at t		Score
			200-274	275-349	
Male	0.29	0.30	0.29	0.30	1.193
	(0.45)	(0.46)	(0.46)	(0.46)	(1.48)
Age	41.36	38.85	39.12	37.58	-1.011***
	(10.70)	(8.94)	(9.05)	(8.45)	(13.97)
Years of experience	17.96	14.85	14.89	14.18	1.520***
	(12.14)	(9.42)	(9.57)	(8.80)	(9.04)
Degree in education	0.93	0.97	0.96	0.98	6.893***
	(0.25)	(0.18)	(0.20)	(0.14)	(3.53)
Primary school teacher	0.57	0.58	0.56	0.61	2.221***
	(0.49)	(0.49)	(0.50)	(0.49)	(2.92)
Total hours	38.20	38.76	38.65	39.04	0.023
	(8.85)	(8.28)	(8.14)	(8.44)	(0.44)
Working at more than one school	0.12	0.16	0.16	0.16	-0.544
	(0.32)	(0.36)	(0.36)	(0.37)	(0.49)
Private-subsidized school	0.45	0.57	0.58	0.57	1.562*
	(0.50)	(0.50)	(0.49)	(0.50)	(1.88)
SNED awarded school	0.30	0.36	0.35	0.38	3.338***
	(0.46)	(0.48)	(0.48)	(0.48)	(4.48)
Santiago metropolitan region	0.33	0.32	0.32	0.32	-1.491*
	(0.47)	(0.47)	(0.47)	(0.47)	(1.91)
Rural school	0.14	0.11	0.11	0.11	-2.579**
	(0.35)	(0.31)	(0.31)	(0.31)	(2.02)
N	1,297,132	8,633	5,553	2,547	8,633

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Columns one to four present the mean of the descriptive variable for the referred sample, with the standard deviation in parenthesis. Column five presents the beta coefficients of an OLS regression of the score on the descriptive variables, plus the years of experience squared, and a battery of application wave fix effects. Robust standard errors are presented in parenthesis.

Table 6. Teacher Turnover among AEP Applicants

Panel A. AEP applicants

	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Same school	0.87	0.88	0.84	0.83	0.80	0.77
New at school	0.12	0.09	0.10	0.09	0.10	0.09
Out	0.00	0.03	0.06	0.08	0.11	0.13

Panel B. Awardees

	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Same school	0.88	0.89	0.86	0.85	0.81	0.78
New at school	0.11	0.08	0.09	0.08	0.09	0.09
Out	0.00	0.02	0.05	0.07	0.10	0.12

Panel C. Non-Awardees

	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Same school	0.87	0.88	0.84	0.82	0.79	0.79
New at school	0.13	0.09	0.10	0.10	0.10	0.09
Out	0.00	0.03	0.06	0.08	0.11	0.14

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sample of 8,633 AEP applicants. Transitions from $t+k$ to $t+k+1$ observe at $t+k+1$. At every time $t+k$ a teacher can stay at the same school, change from school, or move out of the voucher school system. A teacher that is out of the voucher system at $t+k$ and returns to teaching at $t+k+1$ is considered as a new at a school.

Table 7. Test for Continuity of the Density of the Score

	All	2003	2004	2005	2006	2007	2008	2009	2010	2011
Calonico, Cattaneo and Titiunik (2014)	0.314	0.715	0.070	0.610	0.351	0.479	0.612	0.535	0.789	0.528
Frandsen (2017)	0.465	0.462	0.266	0.250	0.784	0.754	0.412	0.875	0.277	0.856
McCrary (2008)	0.926	0.834	0.826	0.935	0.355	0.000	0.699	0.016	0.567	0.641

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: We allow Calonico, Cattaneo and Titiunik (2014) and McCrary (2008) to select the optimal bandwidth independently. For the McCrary (2008) test we set a bin size of 1 to account for the discrete nature of our running variable.

Table 8. Balance of Predetermined Covariates

	β	s.e.	BW	N
Male	0.035	0.041	19	3,301
Age	-0.359	0.723	21	3,532
Years of experience	-0.739	0.763	20	3,468
Degree in education	0.010	0.014	24	4,149
Primary school teacher	0.006	0.044	18	3,137
Total hours	-0.880	0.725	17	3,137
Working at more than one school	-0.014	0.032	19	3,468
Private-subsidized school	0.001	0.045	17	3,137
SNED awarded school	-0.002	0.039	25	4,149
Santiago metropolitan region	-0.014	0.041	18	3,301
Rural school	0.017	0.027	21	3,775

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Data for teachers' applying to AEP waves 2003-2011, at the time of application. Columns 1 and 2 reports the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 3 and 4 present the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth and the effective sample size. The specification includes wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 9. Continuity of Predicted Teachers' Transitions Out of the Voucher School System and Mobility

	Mean	β	s.e.	BW	N
Out of voucher system	0.19	0.002	0.006	25	4,384
New at school	0.32	0.005	0.009	21	3,532

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the average predicted probabilities constructed using a logit model of the outcome variable on with predetermined covariates and application wave fixed effect as regressors. Columns 2 and 3 report the estimates of local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 3 and 4 present the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth and the effective sample size. The unit of observation for the parametric regression is the score-wave average weighted by the number of teachers in each cell. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 10. Effect of AEP on Teachers' Transitions Out of the Voucher School System

	Mean	β	s.e.	BW	N
Out of school system ($t+1$ to $t+5$)	0.19	-0.005	0.028	28	4,785
No. of years out of school system ($t+1$ to $t+5$)	0.40	-0.006	0.077	23	4,084
Out of school system at $t+1$ or $t+2$	0.07	0.016	0.018	22	3,839

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 11. Effect of AEP on Teachers' Transitions Out of the Voucher School System by Gender

	Mean	β	s.e.	BW	N
Panel A. Females					
Out of school system ($t+1$ to $t+5$)	0.18	0.001	0.034	27	3,237
No. of years out of school system ($t+1$ to $t+5$)	0.39	0.034	0.088	23	2,903
Out of school system at $t+1$ or $t+2$	0.07	0.026	0.021	24	2,903
Panel B. Males					
Out of school system ($t+1$ to $t+5$)	0.20	-0.017	0.054	25	1,198
No. of years out of school system (($t+1$ to $t+5$)	0.43	-0.114	0.144	27	1,335
Out of school system at $t+1$ or $t+2$	0.07	-0.022	0.032	24	1,198

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Reproductive age defined as 35 or lower. Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2014b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 12. Effect of AEP on Teachers' Transitions Out of the Voucher School System by Experience

	Mean	β	s.e.	BW	N
Panel A. 1 to 5 years of experience					
Out of school system ($t+1$ to $t+5$)	0.26	-0.036	0.072	23	801
No. of years out of school system ($t+1$ to $t+5$)	0.59	0.039	0.167	19	696
Out of school system at $t+1$ or $t+2$	0.11	0.036	0.043	20	727
Panel B. 6 to 15 years of experience					
Out of school system ($t+1$ to $t+5$)	0.19	0.019	0.056	22	1,428
No. of years out of school system ($t+1$ to $t+5$)	0.42	-0.009	0.155	22	1,452
Out of school system at $t+1$ or $t+2$	0.08	0.035	0.038	20	1,343
Panel C. 16+ years of experience					
Out of school system ($t+1$ to $t+5$)	0.15	-0.005	0.040	25	1,824
No. of years out of school system ($t+1$ to $t+5$)	0.30	-0.048	0.092	24	1,692
Out of school system at $t+1$ or $t+2$	0.05	-0.009	0.021	19	1,360

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 13. Effect of AEP on Teachers' Mobility within the Voucher School System

	Mean	β	s.e.	BW	N
New at school ($t+1$ to $t+5$)	0.32	0.054*	0.037	23	4,084
No. of years new at school ($t+1$ to $t+5$)	0.47	0.075	0.058	27	4,664
New at school at $t+1$ or $t+2$	0.16	0.061**	0.034	17	3,137

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 14. Effect of AEP on Teachers' Mobility within the Voucher School System by Gender

	Mean	β	s.e.	BW	N
Panel A. Females					
New at school ($t+1$ to $t+5$)	0.31	0.051	0.042	26	3,125
No. of years new at school ($t+1$ to $t+5$)	0.44	0.097	0.068	24	2,951
New at school at $t+1$ or $t+2$	0.16	0.045	0.037	21	2,509
Panel B. Males					
New at school ($t+1$ to $t+5$)	0.35	0.111*	0.080	16	878
No. of years new at school ($t+1$ to $t+5$)	0.53	0.031	0.139	23	1,098
New at school at $t+1$ or $t+2$	0.17	0.073	0.062	17	920

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Reproductive age defined as 35 or lower. Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 15. Effect of AEP on Teachers' Mobility within the Voucher School System by Experience

	Mean	β	s.e.	BW	N
Panel A. 1 to 5 years of experience					
New at school ($t+1$ to $t+5$)	0.41	-0.021	0.086	22	791
No. of years new at school ($t+1$ to $t+5$)	0.62	0.017	0.136	28	966
New at school at $t+1$ or $t+2$	0.21	0.050	0.069	24	854
Panel B. 6 to 15 years of experience					
New at school ($t+1$ to $t+5$)	0.35	0.022	0.074	17	1,184
No. of years new at school ($t+1$ to $t+5$)	0.52	0.030	0.115	21	1,343
New at school at $t+1$ or $t+2$	0.18	0.021	0.057	20	1,320
Panel C. 16+ years of experience					
New at school ($t+1$ to $t+5$)	0.25	0.112**	0.048	28	1,994
No. of years new at school ($t+1$ to $t+5$)	0.36	0.147**	0.076	30	2,041
New at school at $t+1$ or $t+2$	0.12	0.072*	0.043	18	1,290

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 16. Effect of AEP on Teachers' Mobility within the Voucher School System by SNED Sub-Index School of Destination

	Mean	β	s.e.	BW	N
Panel A. High effectiveness school					
$t+1$ to $t+5$	0.68	0.093**	0.042	16	2,802
No. of years ($t+1$ to $t+5$)	3.00	0.242	0.202	17	3,137
$t+1$ or $t+2$	0.63	0.078**	0.042	17	3,116
Panel B. High improvement school					
$t+1$ to $t+5$	0.61	0.007	0.040	23	3,820
No. of years ($t+1$ to $t+5$)	2.61	-0.063	0.207	20	3,468
$t+1$ or $t+2$	0.56	0.001	0.044	20	3,445
Panel C. High initiative school					
$t+1$ to $t+5$	0.68	0.021	0.036	25	4,128
No. of years ($t+1$ to $t+5$)	3.03	0.092	0.179	24	4,149
$t+1$ or $t+2$	0.64	0.021	0.035	28	4,753
Panel D. High equality of opportunity school					
$t+1$ to $t+5$	0.78	0.006	0.030	28	4,640
No. of years ($t+1$ to $t+5$)	3.53	-0.005	0.159	27	4,664
$t+1$ or $t+2$	0.74	0.008	0.031	30	4,993
Panel E. High teacher parent participation school					
$t+1$ to $t+5$	0.74	0.042	0.033	24	4,128
No. of years ($t+1$ to $t+5$)	3.32	0.083	0.182	21	3,775
$t+1$ or $t+2$	0.70	0.019	0.036	24	4,120
Panel F. High working conditions schools					
$t+1$ to $t+5$	0.58	0.004	0.040	24	4,063
No. of years ($t+1$ to $t+5$)	2.52	-0.001	0.186	24	4,149
$t+1$ or $t+2$	0.53	-0.013	0.039	26	4,354

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: *High* type schools have an average standardized sub-index above the median. Standardization at the SNED homogenous group level. *Effectiveness* refers to the 4th, 8th and 10th grade students standardized tests' scores, in levels. *Improvement* refers to the inter-cohort students gains. *Equality* captures repetition and dropout rates, discriminatory practices, and integration of physically challenged students. *Initiative* captures school education activities. *Participation* refers for parental participation and parents' perception of the quality of the school. *Working conditions* captures schools placement in a survey from the Ministry of Education. Further description of the content of the SNED sub-index can be found in Mizala and Urquiola (2013). Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 17. Effect of AEP on Teachers' Mobility within the Voucher School System by School at Application

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
New at school ($t+1$ to $t+5$)	0.33	0.011	0.048	24	2,424
No. of years new at school ($t+1$ to $t+5$)	0.49	-0.006	0.080	24	2,424
New at school at $t+1$ or $t+2$	0.17	0.029	0.042	19	2,025
Panel B. Municipal school					
New at school ($t+1$ to $t+5$)	0.31	0.102**	0.055	25	1,819
No. of years new at school ($t+1$ to $t+5$)	0.43	0.176**	0.085	31	2,069
New at school at $t+1$ or $t+2$	0.15	0.075	0.050	19	1,436
Panel C. SNED awarded school					
New at school ($t+1$ to $t+5$)	0.23	0.070	0.061	18	1,225
No. of years new at school ($t+1$ to $t+5$)	0.31	0.071	0.096	20	1,292
New at school at $t+1$ or $t+2$	0.13	0.029	0.050	19	1,292
Panel D. Non-SNED awarded school					
New at school ($t+1$ to $t+5$)	0.35	0.051	0.049	23	2,408
No. of years new at school ($t+1$ to $t+5$)	0.51	0.110	0.086	21	2,366
New at school at $t+1$ or $t+2$	0.18	0.071**	0.040	20	2,212
Panel E. Santiago metropolitan region					
New at school ($t+1$ to $t+5$)	0.35	0.238***	0.086	12	680
No. of years new at school ($t+1$ to $t+5$)	0.54	0.429***	0.151	12	747
New at school at $t+1$ or $t+2$	0.19	0.037	0.057	22	1,191
Panel F. Outside Santiago					
New at school ($t+1$ to $t+5$)	0.31	0.020	0.049	20	2,367
No. of years new at school ($t+1$ to $t+5$)	0.43	0.037	0.078	20	2,367
New at school at $t+1$ or $t+2$	0.15	0.054	0.039	19	2,256
Panel G. Rural school					
New at school ($t+1$ to $t+5$)	0.39	-0.069	0.133	18	334
No. of years new at school ($t+1$ to $t+5$)	0.54	-0.124	0.220	16	312
New at school at $t+1$ or $t+2$	0.20	-0.011	0.104	21	400
Panel H. Urban school					
New at school ($t+1$ to $t+5$)	0.31	0.082**	0.042	19	3,100
No. of years new at school ($t+1$ to $t+5$)	0.46	0.133**	0.070	20	3,100
New at school at $t+1$ or $t+2$	0.16	0.093***	0.037	14	2,357

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects. Teachers out of the school system coded as zeros. Table A6 replicates the analysis for active teachers only.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 18. Effect of AEP on Municipal School Teachers' Mobility by School of Destination

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.07	0.016	0.035	21	1,557
No. of years ($t+1$ to $t+5$)	0.18	0.084	0.107	21	1,462
$t+1$ or $t+2$	0.03	0.011	0.020	29	1,984
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.59	0.053	0.059	25	1,716
No. of years ($t+1$ to $t+5$)	1.75	0.275	0.241	19	1,436
$t+1$ or $t+2$	0.41	0.062	0.069	18	1,295
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	0.22	0.022	0.050	25	1,819
No. of years ($t+1$ to $t+5$)	1.09	0.126	0.245	26	1,885
$t+1$ or $t+2$	0.22	0.026	0.050	26	1,819
Panel D. Rural school					
$t+1$ to $t+5$	0.21	0.060	0.054	19	1,365
No. of years ($t+1$ to $t+5$)	0.89	0.221	0.237	20	1,436
$t+1$ or $t+2$	0.19	0.061	0.052	19	1,365

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of municipal school teachers at the time of application. Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 19. Effect of AEP on Non-SNED-Awarded School Effect Teachers' Mobility within the Voucher School System by School at Application

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.56	0.021	0.049	24	2,620
No. of years ($t+1$ to $t+5$)	2.54	0.138	0.236	24	2,620
$t+1$ or $t+2$	0.54	0.028	0.049	24	2,620
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.50	0.086*	0.052	22	2,408
No. of years ($t+1$ to $t+5$)	1.26	0.334**	0.194	15	1,766
$t+1$ or $t+2$	0.26	0.123**	0.056	15	1,649
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	0.33	-0.002	0.050	21	2,366
No. of years ($t+1$ to $t+5$)	1.62	0.016	0.248	21	2,366
$t+1$ or $t+2$	0.33	0.007	0.050	21	2,366
Panel D. Rural school					
$t+1$ to $t+5$	0.14	0.010	0.036	22	2,408
No. of years ($t+1$ to $t+5$)	0.54	-0.003	0.138	23	2,408
$t+1$ or $t+2$	0.12	0.005	0.031	23	2,408

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of teachers of non-SNED awarded schools at the time of application. Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 20. Effect of AEP on Santiago Metropolitan Area Teachers' Mobility by School of Destination

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.72	0.004	0.065	23	1,220
No. of years ($t+1$ to $t+5$)	3.30	-0.366	0.348	19	1,101
$t+1$ or $t+2$	0.70	-0.038	0.070	20	1,118
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.64	-0.015	0.072	20	1,118
No. of years ($t+1$ to $t+5$)	1.92	-0.305	0.296	19	1,101
$t+1$ or $t+2$	0.45	0.049	0.081	19	1,045
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	1.00	-0.007	0.010	21	1,118
No. of years ($t+1$ to $t+5$)	4.92	-0.049	0.060	23	1,297
$t+1$ or $t+2$	1.00	-0.007	0.010	21	1,118
Panel D. Rural school					
$t+1$ to $t+5$	0.07	0.027	0.037	24	1,324
No. of years ($t+1$ to $t+5$)	0.23	0.079	0.127	25	1,324
$t+1$ or $t+2$	0.05	0.029	0.030	28	1,514

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of teachers of schools located in Santiago Metropolitan Area at the time of application. Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 21. Effect of AEP on Urban School Teachers' Mobility by School of Destination

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.62	0.016	0.038	25	3,917
No. of years ($t+1$ to $t+5$)	2.85	0.020	0.205	21	3,375
$t+1$ or $t+2$	0.61	0.016	0.041	22	3,432
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.64	0.027	0.040	25	3,712
No. of years ($t+1$ to $t+5$)	1.94	0.040	0.158	23	3,651
$t+1$ or $t+2$	0.46	0.038	0.043	22	3,375
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	0.35	-0.047	0.047	16	2,671
No. of years ($t+1$ to $t+5$)	1.70	-0.172	0.230	17	2,803
$t+1$ or $t+2$	0.34	-0.032	0.046	17	2,803
Panel D. Rural school					
$t+1$ to $t+5$	0.03	0.003	0.017	22	3,432
No. of years ($t+1$ to $t+5$)	0.08	-0.024	0.045	23	3,651
$t+1$ or $t+2$	0.01	-0.006	0.010	24	3,651

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of urban schools' teachers at the time of application. Column 1 reports the in-sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Appendix

Table A1. T Effect of AEP on Teachers' Transitions to Private Schools

	Mean	β	s.e.	BW	N
Private school ($t+1$ to $t+5$)	0.04	-0.003	0.013	27	4,664
No. of years new at private school ($t+1$ to $t+5$)	0.09	0.027	0.040	23	4,084
Private at school at $t+1$ or $t+2$	0.02	0.005	0.009	21	3,775

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A2. Effect of AEP on Active Teachers' Mobility within the Voucher School System

	Mean	β	s.e.	BW	N
New at school ($t+1$ to $t+5$)	0.32	0.055*	0.037	24	4,042
No. of years new at school ($t+1$ to $t+5$)	0.47	0.075	0.058	27	4,664
New at school at $t+1$ or $t+2$	0.16	0.064**	0.034	17	3,090

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Variables computed for the years in which the teacher was active in the Voucher School System. Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A3. Effect of AEP on Active Teachers' Mobility within the Voucher School System by Gender

	Mean	β	s.e.	BW	N
Panel A. Females					
New at school ($t+1$ to $t+5$)	0.31	0.056	0.043	25	3,095
No. of years new at school ($t+1$ to $t+5$)	0.44	0.097	0.068	24	2,951
New at school at $t+1$ or $t+2$	0.16	0.048	0.037	21	2,476
Panel B. Males					
New at school ($t+1$ to $t+5$)	0.36	0.109*	0.080	17	866
No. of years new at school ($t+1$ to $t+5$)	0.53	0.031	0.139	23	1,098
New at school at $t+1$ or $t+2$	0.18	0.075	0.063	17	904

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Variables computed for the years in which the teacher was active in the Voucher School System. Reproductive age defined as 35 or lower. Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A4. Effect of AEP on Active Teachers' Mobility within the Voucher School System by Experience

	Mean	β	s.e.	BW	N
Panel A. 1 to 5 years of experience					
New at school ($t+1$ to $t+5$)	0.42	-0.007	0.087	22	777
No. of years new at school ($t+1$ to $t+5$)	0.62	0.017	0.136	28	966
New at school at $t+1$ or $t+2$	0.22	0.062	0.071	23	832
Panel B. 6 to 15 years of experience					
New at school ($t+1$ to $t+5$)	0.36	0.020	0.074	18	1,172
No. of years new at school ($t+1$ to $t+5$)	0.52	0.030	0.115	21	1,343
New at school at $t+1$ or $t+2$	0.18	0.022	0.057	20	1,328
Panel C. 16+ years of experience					
New at school ($t+1$ to $t+5$)	0.26	0.111**	0.051	25	1,812
No. of years new at school ($t+1$ to $t+5$)	0.36	0.147**	0.076	30	2,041
New at school at $t+1$ or $t+2$	0.13	0.073*	0.044	18	1,275

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Variables computed for the years in which the teacher was active in the Voucher School System. Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A5. Effect of AEP on Teachers' Mobility within the Voucher School System by Absolute SNED Sub-Index School of Destination

	Mean	β	s.e.	BW	N
Panel A. High effectiveness school					
$t+1$ to $t+5$	0.77	0.030	0.032	25	4,120
No. of years ($t+1$ to $t+5$)	3.52	0.065	0.159	26	4,384
$t+1$ or $t+2$	0.74	0.026	0.037	21	3,500
Panel B. High improvement school					
$t+1$ to $t+5$	0.47	-0.005	0.038	25	4,120
No. of years ($t+1$ to $t+5$)	1.95	-0.052	0.179	24	4,149
$t+1$ or $t+2$	0.42	0.001	0.035	30	4,855
Panel C. High initiative school					
$t+1$ to $t+5$	0.47	0.028	0.036	30	4,991
No. of years ($t+1$ to $t+5$)	1.99	0.034	0.191	23	4,084
$t+1$ or $t+2$	0.42	0.005	0.038	26	4,343
Panel D. High equality of opportunity school					
$t+1$ to $t+5$	0.84	0.004	0.031	21	3,748
No. of years ($t+1$ to $t+5$)	3.85	0.050	0.151	25	4,384
$t+1$ or $t+2$	0.80	0.008	0.030	25	4,109
Panel E. High teacher parent participation school					
$t+1$ to $t+5$	0.79	0.012	0.032	24	4,120
No. of years ($t+1$ to $t+5$)	3.61	-0.031	0.173	22	3,775
$t+1$ or $t+2$	0.75	-0.003	0.034	22	3,803
Panel F. High working conditions schools					
$t+1$ to $t+5$	0.54	0.047	0.038	25	4,120
No. of years ($t+1$ to $t+5$)	2.33	0.176	0.201	21	3,532
$t+1$ or $t+2$	0.49	0.029	0.040	24	4,045

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: *High* type schools have an average (non-standardized) sub-index above the median. *Effectiveness* refers to the 4th, 8th and 10th grade students standardized tests' scores, in levels. *Improvement* refers to the inter-cohort students gains. *Equality* captures repetition and dropout rates, discriminatory practices, and integration of physically challenged students. *Initiative* captures school education activities. *Participation* refers for parental participation and parents' perception of the quality of the school. *Working conditions* captures schools placement in a survey from the Ministry of Education. Further description of the content of the SNED sub-index can be found in Mizala and Urquiola (2013). Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A6. Effect of AEP on Active Teachers' Mobility within the Voucher School System by School at Application

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
New at school ($t+1$ to $t+5$)	0.34	0.014	0.047	26	2,604
No. of years new at school ($t+1$ to $t+5$)	0.49	-0.006	0.080	24	2,424
New at school at $t+1$ or $t+2$	0.17	0.031	0.042	20	1,985
Panel B. Municipal school					
New at school ($t+1$ to $t+5$)	0.31	0.102**	0.055	25	1,813
No. of years new at school ($t+1$ to $t+5$)	0.43	0.176**	0.085	31	2,069
New at school at $t+1$ or $t+2$	0.15	0.076*	0.050	19	1,428
Panel C. SNED awarded school					
New at school ($t+1$ to $t+5$)	0.28	0.096*	0.068	18	1,141
No. of years new at school ($t+1$ to $t+5$)	0.40	0.123	0.113	17	1,152
New at school at $t+1$ or $t+2$	0.13	0.030	0.051	20	1,274
Panel D. Non-SNED awarded school					
New at school ($t+1$ to $t+5$)	0.35	0.055	0.049	23	2,383
No. of years new at school ($t+1$ to $t+5$)	0.51	0.110	0.086	21	2,366
New at school at $t+1$ or $t+2$	0.18	0.073**	0.040	21	2,179
Panel E. Santiago metropolitan region					
New at school ($t+1$ to $t+5$)	0.35	0.235***	0.085	12	733
No. of years new at school ($t+1$ to $t+5$)	0.54	0.429***	0.151	12	747
New at school at $t+1$ or $t+2$	0.19	0.041	0.056	23	1,191
Panel F. Outside Santiago					
New at school ($t+1$ to $t+5$)	0.31	0.021	0.049	20	2,350
No. of years new at school ($t+1$ to $t+5$)	0.43	0.037	0.078	20	2,367
New at school at $t+1$ or $t+2$	0.15	0.056	0.039	18	2,233
Panel G. Rural school					
New at school ($t+1$ to $t+5$)	0.39	-0.066	0.129	19	367
No. of years new at school ($t+1$ to $t+5$)	0.54	-0.124	0.220	16	312
New at school at $t+1$ or $t+2$	0.20	-0.007	0.103	21	399
Panel H. Urban school					
New at school ($t+1$ to $t+5$)	0.32	0.084**	0.042	20	3,066
No. of years new at school ($t+1$ to $t+5$)	0.46	0.133**	0.070	20	3,100
New at school at $t+1$ or $t+2$	0.16	0.096***	0.037	14	2,318

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico et al. (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A7. Effect of AEP on Private-Subsidized School Teachers' Mobility by School of Destination

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.98	-0.011	0.014	22	2,247
No. of years ($t+1$ to $t+5$)	4.56	-0.129	0.104	30	2,947
$t+1$ or $t+2$	0.97	-0.016	0.016	22	2,247
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.68	0.032	0.049	23	2,386
No. of years ($t+1$ to $t+5$)	2.06	-0.016	0.173	29	2,865
$t+1$ or $t+2$	0.49	0.025	0.053	23	2,247
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	0.41	-0.069	0.058	18	1,836
No. of years ($t+1$ to $t+5$)	1.97	-0.266	0.280	18	1,930
$t+1$ or $t+2$	0.40	-0.050	0.057	18	1,930
Panel D. Rural school					
$t+1$ to $t+5$	0.07	0.013	0.029	29	2,791
No. of years ($t+1$ to $t+5$)	0.25	0.015	0.105	29	2,791
$t+1$ or $t+2$	0.06	-0.007	0.028	22	2,247

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of private-subsidized school teachers at the time of application. Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A8. Effect of AEP on SNED Awarded School Teachers' Mobility by School of Destination

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.63	-0.010	0.067	19	1,225
No. of years ($t+1$ to $t+5$)	2.90	-0.359	0.344	16	1,103
$t+1$ or $t+2$	0.61	-0.038	0.070	17	1,152
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.91	-0.018	0.035	22	1,431
No. of years ($t+1$ to $t+5$)	3.13	-0.043	0.232	20	1,320
$t+1$ or $t+2$	0.81	-0.031	0.050	22	1,431
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	0.32	-0.076	0.071	16	1,051
No. of years ($t+1$ to $t+5$)	1.54	-0.297	0.338	17	1,103
$t+1$ or $t+2$	0.31	-0.059	0.068	17	1,103
Panel D. Rural school					
$t+1$ to $t+5$	0.12	0.050	0.053	19	1,292
No. of years ($t+1$ to $t+5$)	0.49	0.214	0.236	19	1,292
$t+1$ or $t+2$	0.11	0.043	0.050	20	1,320

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of teachers of SNED awarded schools at the time of application. Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A9. Effect of AEP on Outside Santiago Metropolitan Area Teachers' Mobility by School of Destination

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.52	0.014	0.053	19	2,256
No. of years ($t+1$ to $t+5$)	2.38	0.142	0.253	19	2,256
$t+1$ or $t+2$	0.51	0.027	0.052	19	2,367
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.64	0.062	0.046	23	2,787
No. of years ($t+1$ to $t+5$)	1.93	0.314**	0.185	19	2,367
$t+1$ or $t+2$	0.46	0.033	0.047	23	2,787
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	0.01	-0.025**	0.014	15	1,790
No. of years ($t+1$ to $t+5$)	0.04	-0.051*	0.034	13	1,669
$t+1$ or $t+2$	0.01	-0.008	0.008	14	1,669
Panel D. Rural school					
$t+1$ to $t+5$	0.17	0.027	0.040	20	2,367
No. of years ($t+1$ to $t+5$)	0.66	0.085	0.170	20	2,414
$t+1$ or $t+2$	0.15	0.016	0.036	21	2,414

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of teachers of schools located outside Santiago Metropolitan Area at the time of application. Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A10. Effect of AEP on Rural School Teachers' Mobility by School of Destination

	Mean	β	s.e.	BW	N
Panel A. Private-subsidized school					
$t+1$ to $t+5$	0.27	-0.007	0.136	15	295
No. of years ($t+1$ to $t+5$)	1.20	-0.065	0.584	15	295
$t+1$ or $t+2$	0.26	-0.032	0.134	15	278
Panel B. SNED awarded school					
$t+1$ to $t+5$	0.66	0.132	0.121	16	295
No. of years ($t+1$ to $t+5$)	1.83	0.906**	0.482	13	242
$t+1$ or $t+2$	0.44	-0.020	0.148	13	258
Panel C. Santiago metropolitan region					
$t+1$ to $t+5$	0.15	0.080	0.075	26	467
No. of years ($t+1$ to $t+5$)	0.70	0.400	0.395	23	433
$t+1$ or $t+2$	0.14	0.086	0.074	26	467
Panel D. Rural school					
$t+1$ to $t+5$	0.94	0.032	0.059	25	467
No. of years ($t+1$ to $t+5$)	4.08	0.112	0.404	23	407
$t+1$ or $t+2$	0.93	0.046	0.064	27	496

Source: Authors' calculations based on data from the Ministry of Education (Chile).
Notes: Sub-sample of rural schools teachers at the time of application. Column 1 reports the in sample average of the outcome variable. Columns 2 and 3 present the results of a local non-parametric RDD specification in the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth, with a triangular kernel, a linear polynomial of the score, and with robust corrected standard errors. Columns 4 and 5 present the Calonico, Cattaneo and Titiunik (2104b) optimal bandwidth and the effective sample size. All specifications include wave fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.