This paper investigates whether employers use university prestige as a signal of workers' unobservable productivity. Our test is based on employer learning-statistical discrimination models, which suggest that if employers use university reputation to predict a worker's unobservable quality, then college prestige should become less important for earnings as a worker gains labor market experience. In this framework, we use a regression discontinuity design to estimate a 13% wage premium for college graduates in their first year of the labor market who were barely accepted by one of the two most prestigious universities in Chile compared with those barely rejected by these two schools. However, we find that this premium decreases to 4% for workers with 6 or more years of labor market experience. This result suggests that college prestige becomes less important for employers as workers reveal their quality throughout their careers.

1. Introduction

Graduating from a prestigious university is widely viewed as a pathway to labor market success. Many high-paying companies actively recruit on elite university campuses, which lead students from name-brand colleges to obtain more favorable positions and higher salaries in the beginning of their careers. However, while it is widely believed that graduating from an elite university is associated with better career prospects, little is known about the mechanisms driving this result.

In this paper, we shed some light on the reasons why workers from very prestigious universities receive higher wages after graduation. On one hand, attending a prestigious university could be associated with receiving better instruction and having more accomplished peers. In this context, prestigious universities have an advantage of increasing a worker's productivity in comparison with less prestigious universities. On the other hand, the main effect of attending a prestigious university might be to signal to employers the unobservable inherent ability of a worker. Elite universities often have a very competitive application process and tend to select higher-quality candidates. In this framework, the value added from a prestigious college education might not be significantly higher than that from a less prestigious university.

To test whether employers use university prestige as a signal of recent graduates’ unobservable quality, we rely on the employer learning-statistical discrimination (EL-SD) literature (Altonji & Pierret, 2001). The underlying assumption is that in the early stages, employers assess workers on the basis of easily observable variables that correlate with their unobservable productivity. As a worker gains experience in the labor market, employers weigh these characteristics with other information that becomes available, such as references and on-the-job performance. As a result, if employers use a characteristic to statistically discriminate a worker in the early stage of his career, this characteristic should become less important for earnings as a worker reveals his productivity over time. Our study’s main innovation is to propose an EL-SD test using a regression discontinuity design.

For this purpose, we use data from the Futuro Laboral Project of the Chilean Ministry of Education that follows different cohorts of Chilean college graduates during their first years in the labor market, the period in which most employer learning happens (Lange, 2007). The data...
presents information on labor market outcomes such as earnings, and we can identify workers who graduate from elite universities. Finally, the data contains information on the Chilean centralized test for admission to universities. This information will be used as a running variable in the regression discontinuity test we propose.2

We take advantage of Chile’s centralized university admission process to propose a statistical discrimination test based on a regression discontinuity design (RD). Using information from the admission test scores, we are able to identify workers who were just above or below the admission thresholds to the two most prestigious universities in Chile: University of Chile and the Pontifical Catholic University of Chile. We propose an RD statistical discrimination test that compares the earnings dynamics between these two groups of workers as they gain experience in the labor market. The test assumption is that workers just above and below the admission thresholds are similar in terms of their pre-college characteristics. The RD statistical discrimination test predicts that if employers use university prestige to statistically discriminate workers, then: (i) individuals barely admitted to the most prestigious universities in Chile should be paid substantially more than those barely rejected when they graduate from college; (ii) the wage differential between these two groups of workers should shrink as workers progress in their careers.

In this paper, we contribute to the EL-SD literature by introducing a RD test, which has benefits over the traditional test proposed by Altonji and Pierret (2001). In contrast with the traditional EL-SD test, the estimation of the regression discontinuity test can be interpreted as the causal effect of graduating from a prestigious university on earnings for those near the admission cutoff. We show that, different from the traditional EL-SD test, our RD approach is not biased by an individual’s other characteristics that might be used by employers for statistical discrimination, such as family socioeconomic status.3

Our regression discontinuity test shows strong evidence that employers use university prestige as a signal of recent graduates’ unobservable characteristics. We estimate a 13% wage premium for those just above the admission cutoff in their first year in the labor market compared to those just below the admission cutoff. However, we find that this premium decreases to 4% for workers with 6 or more years of labor market experience. In addition, we cannot reject that the premium for more experienced workers is statistically different from zero. We show that our main findings are generally robust to bandwidth selection methods, kernel weight function choices, and the exclusion of covariates.

Consistent with the statistical discrimination literature, we interpret our finding of rapid decreases in the elite college premium for workers with similar pre-university characteristics as evidence that strong signaling mechanisms drive the prestigious university wage premium. Other possible theories that explain this pattern would require that individuals who graduated from a less prestigious university benefit more from on-the-job training than those who went to a prestigious university or that workers from prestigious universities experience a rapid human capital depreciation.4 While we cannot directly test these alternative theories using our data, we provide further evidence supporting the EL-SD test by following the empirical specification suggested by MacLeod, Riehl, Saavedra, and Urquiola (2017). Using the mean admission score of graduates as a measure of a college’s reputation, we show that the correlation of earnings and reputation decreases with experience while the correlation between earnings and scores increases with experience. While this test does not identify the causal effect of reputation or admission scores, its result is consistent with employers using college reputation as a signal of an employee’s unobservable ability and learning overtime.

There is extensive EL-SD literature analyzing the use of race, gender, and schooling for statistical discrimination. More recently, a few papers have explored how employers use university prestige to statistically discriminate workers: Lang and Siniver (2011), Araki, Kawaguchi, and Onozuka (2016), MacLeod et al. (2017), Carroll, Heaton, and Tani (2019), and Barrera and Bayona (2019). While Lang and Siniver (2011) have a similar approach to estimating how returns on attending an elite university in Israel change with labor market experience, the authors are unable to fully exploit the regression discontinuity in the college admissions process.5 Using data from Colombia, MacLeod et al. (2017) find that college identity plays an informational role in the labor market. The introduction of a college exit exam, which was observed by employers, reduced the correlation of earnings with college reputation. However, the paper also finds that signaling is not the whole story. They show that college reputation is positively correlated with graduates’ earnings growth, suggesting that reputation matters beyond signaling individual skill. Carroll et al. (2019) use Australian data to investigate the existence of a wage premium for elite universities; however, they do not observe individual data on test scores, so they rely on score averages of each academic program to estimate a positive but small wage premium using weighted least squares. Finally, Barrera and Bayona (2019) use a regression discontinuity design and find no evidence of human capital formation from a prestigious school in Colombia using college exit exam scores, but they find positive effects on the probability of employment and earnings after the first year of graduation, which is consistent with signaling.

Second, we contribute to the literature that studies the effect of graduating from an elite university on labor market outcomes. There is an extensive series of papers that estimate the returns to graduating from a selective university on earnings (Arteaga, 2018; Black & Smith, 2006; Brewer, Eide, & Ehrenberg, 1999; Dale & Krueger, 2002; Hoekstra, 2009; Saavedra, 2008). However, none of these papers have explored how the university selectivity wage premium changes throughout a worker’s career and if that translates into differences in earnings in the long run. Most importantly, while there is a significant effort in all of the papers cited above to overcome the selection bias associated with attending a prestigious university, little attention has been paid to the mechanisms that generate the college prestige wage premium. With the caveat that our RD design identifies a local average treatment estimator (LATE), in this paper we shed some light on the reasons why workers from prestigious universities receive higher wages after graduation.

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2 Kaufmann, Messner, and Solis (2012), Hastings,Neillson, and Zimmerman (2013) and Zimmerman et al. (2019) are recent papers that have also explored the discontinuities generated by the centralized admission process for universities in Chile. Kaufmann et al. (2012) looks at the effect of graduating from an elite university on marriage outcomes. Hastings et al. (2013) studies labor market returns to college admission. Zimmerman et al. (2019) shows that students admitted to prestigious universities are more likely to reach managerial positions, but this achievement is concentrated among students who graduated from private high schools. None of these papers explores how the selective university wage premium changes throughout a worker’s career, which is the main object of interest of this paper.
3 As we show in the appendix, the traditional statistical discrimination test presented in Altonji and Pierret (2001) is biased on the basis of the treatment variable. However, as a test of employer learning itself, it is unbiased.
4 Nonetheless, the empirical evidence suggests that investments in school and on-the-job training are complements and not substitutes, and that more educated workers are more likely to receive employer-sponsored training (Mincer, 1988 and Lynch, 1992).
5 The authors obtained the data on test scores and labor market outcomes from a survey of graduates. The total size of their sample is 819 observations, 428 corresponds to the prestigious university and 391 to the college. Their preferred estimation strategy is least squares with a rich set of covariates.
2. Institutional framework

Higher education in Chile comprises three types of institutions: universities, professional institutes, and technical formation centers. Universities provide the highest degree of learning, combining teaching, research, and outreach activities; they teach accredited degree programs (2.5 to 4 years) and award academic degrees (5 to 7 years). Professional institutes grant professional degrees other than those awarded by universities. Technical formation centers are intended to equip higher level technicians with the competencies and skills needed for responding to industry needs in the public and private sectors.

Traditional higher education institutions in Chile include the oldest universities created before 1981, and those institutions created after 1980 that were derived from the older universities. These institutions consist of 25 fully autonomous universities coordinated by the Council of Chancellors of Chilean Universities, which are eligible to obtain partial funding from the state. They employed a single admission process: the Chilean university selection test, the Prueba de Aptitud Académica (PAA), until 2003. This test was composed of three compulsory sub-tests including language, mathematics, and the history and geography of Chile. Additionally, depending on which programs a student is applying to, he or she may be required to take the following major-specific PAA tests: advanced mathematics, physics, chemistry, biology, and history.

The timeline of the admission process for traditional universities is described in Fig. 1. First, students take the PAA test. After receiving their scores, they make their application decisions. Students apply to a major and university (or program) simultaneously. They may only apply to 8 programs, ranking them by preference. The final admission scores consist of a weighted average of the compulsory and major-specific tests and the applicant’s high school GPA, with each program setting its specific PAA weights. The number of vacancies for each program is announced before the application process, and programs fill their vacancies solely based on the final weighted scores. The score of the last student admitted into a program defines the admission score cutoff. Since the cutoffs are not known before the application decisions are made, students cannot manipulate the side of the cutoff on which their scores fall. Nontraditional universities, those created after 1981, may not necessarily use PAA scores to select their incoming students. Nevertheless, the anecdotal evidence is that the majority of students who wish to attend higher education in Chile take the PAA at the end of high school, independent of which university they are planning to attend. The test is relatively inexpensive and administered throughout the country.

All higher education institutions charge tuition and fees. As of 2001, the Chilean higher education system consisted of 60 universities (25 traditional universities and 35 new private universities operating without direct public subsidy), 42 professional institutes, and 117 private technical formation centers.

8 In 2004, Chile’s university selection test was modified, and it is now called Prueba de Selección Universitaria (PSU).

9 For example, the engineering programs in a prestigious university used a weight of 20% mathematics, 10% language, 10% history, 20% high school GPA, 30% advanced mathematics, and 10% physics to calculate applicant’s weighted scores for this program. Different universities might use different weights to calculate the weighted scores for the same majors.

10 Only in 2016, University of Concepcion was granted 7 years of accreditation, the highest possible. However, this university had lower entry scores and lower accreditation during the years relevant for our study.

11 The earnings data only covers individuals who file taxes, thus we are excluding the informal sector. In 2000, it is estimated that only 12% of university graduates were informal (Celhay & Perticara, 2010). Married couples always file taxes separately in Chile. A concern is that a portion of the individuals from prestigious universities might go to graduate school after finishing their baccalaureate studies and would therefore be omitted in the earnings sample.
gathers information on the PAA scores, high school grades, and names of high schools where students graduated from. As the PAA scores have an important role in the regression discontinuity analysis, we restrict our study to this sample. Data on program admission cutoffs by major and year were collected at the universities’ websites (for later application years) and newspapers available at public libraries (for earlier application years).

Wage is measured by the annual income received from jobs and services provided by the individual, and it does not include self-employment income. We use the consumer price index as a deflator to compute real wages. The experience variable is computed as the number of years in which an individual has earned income and has paid taxes after graduation. The final sample consists of 58,179 individuals and 313,077 observations.

Table 1 shows descriptive statistics on the University of Chile and Catholic University and the average of all other universities in Chile. As expected, the two prestigious universities have higher average scores in the math and language components of the PAA tests, and their students have higher high school grades. We observe that 11% of students at prestigious universities have graduated from a private high school, compared with 7% from nonselective universities. We plot the distribution of language and math PAA scores for college graduates from the two prestigious universities and all other universities on Figs. 2 and 3 respectively. One can see from these figures that the language and math scores of graduates from selective universities are concentrated at the higher end of the distribution. Finally, in Table 2 we show that workers from the University of Chile and Catholic University have higher average wages than those from the less prestigious schools, unconditional on any other characteristics.

### 3.1. College applications and the validity of the RD design

The RD test we propose is only valid if students are unable to manipulate their test scores to fall just above the cutoff. While in Section 5 we present empirical evidence against manipulation, there are a few characteristics of the admission process that assure the validity of our empirical strategy. First, students do not have access to admission cutoffs until after they made their application choices. Second, to change institution-degree enrollment, students must wait a year and retake the admission test. Finally, admission cutoffs vary each year depending on demand for and the number of spots universities allocate to each program.

Another potential threat to the validity of our RDD is that our data only include information on college graduates with positive earnings in Chile and therefore omit college dropouts, individuals out of the labor force, and emigrants. While Saavedra (2008) documents that being above the cutoff for a prestigious school increases the probability of graduation and labor force participation in Colombia, evidence shows this might be less of a concern in the Chilean context. First, using 2018 enrollment data from the Statistics Department of the Ministry of Education, we find that college graduation rates are very similar at top universities in Chile. Precisely, the dropout rate at Catholic University

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(footnote continued)

However, using data from the 2000 National Socioeconomic Characterization Survey, we find that only 0.65% of 25–34-year-olds with a bachelor degree were enrolled in graduate school or had obtained a graduate degree.

12 We do not have information on weeks or hours worked in the sample and for this reason we cannot explore how much of the annual income increase is due to changes in hours or work weeks.
Table 2
Earnings for prestigious universities and all other universities.

<table>
<thead>
<tr>
<th></th>
<th>Prestigious Universities</th>
<th>All Other Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Wage (in 1999 Pesos)</td>
<td>8,381,528</td>
<td>5,965,381</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>7,076,382</td>
<td>5,337,433</td>
</tr>
<tr>
<td>Log of Annual Wage (in 1999 Pesos)</td>
<td>15.58</td>
<td>15.19</td>
</tr>
<tr>
<td>Observations</td>
<td>61,844</td>
<td>251,233</td>
</tr>
</tbody>
</table>

Note: University of Chile and the Pontifical Catholic University of Chile are defined as the two prestigious universities in Chile (see Section 3 for details).

of Chile was 8.1%, at University of Chile was 9.1%, at University of Concepción was 9.2%, and at University Santiago de Chile was 11.2%. Second, exploring a similar discontinuity, Zimmerman et al. (2019) show that admission to the University of Chile and Catholic University of Chile does not affect labor force participation rates. In addition, employment attachment rates are relatively high among college graduates in Chile. Using the National Socioeconomic Characterization Survey in the year 2000, we find that 86.7% of 25–34-years-olds with a bachelor’s degree are employed, and of those, 88% work more than 35 h per week.

4. Regression discontinuity EL-SD test and estimation procedure

We propose an EL-SD test based on regression discontinuity design. In the Appendix of the paper, we show that while the EL-SD test presented in Altonji and Pierret (2001) is unbiased as a test of employer learning itself, it could be biased as a statistical discrimination test on the basis of the treatment variable. Different from the traditional EL-SD test, the regression discontinuity test can be interpreted as a causal effect. The test consists of comparing how earnings for those just above and below the admission cutoff change as workers accumulate experience in the labor market.13

4.1. RD Running variable

Our data contains information on the year students took the PAA test, their scores on each component of the test, their high school grades, the college they graduated from, and their major. The data does not include information on students’ college applications. To implement our RD design, we must make two assumptions: (i) all students applied to University of Chile and the Catholic University of Chile;14 (ii) students applied to programs in these two schools that correspond to their college major upon graduation. For example, for an economics major who graduated in 2001, we assume that she applied to the economics program at both the University of Chile and the Catholic University of Chile in 1997 (the year she took the PAA test).

To create our RD running variable, we first construct University of Chile and Catholic University admission weighted scores. These weighted scores are based on an individual subject test score, high school grades, and the university major-specific weights.15 We define *Uchile.Score* and *Catholic.Score* as the University of Chile and Catholic University admission weighted scores respectively.

The next step is to calculate the distance between admission-weighted scores and admission cutoffs at the University of Chile and Catholic University. Data on admission cutoffs were collected at the universities’ websites (for later application years) and newspapers (for earlier application years). For each individual in our sample, we define *Uchile.Dist.Cutoff* and *Catholic.Dist.Cutoff*, as the distance between their admission-weighted score and admission cutoff at the University of Chile and Catholic University of Chile, respectively.

Fig. 4 shows the *Uchile.Dist.Cutoff* and *Catholic.Dist.Cutoff*, for each individual in our sample. Individuals in the top-right quadrant were admitted by both the University of Chile and the Catholic University of Chile; those in the bottom-right quadrant were rejected by the Catholic University and admitted by the University of Chile; those in top-left quadrant were admitted by the Catholic University and rejected by the University of Chile; and those in the bottom left quadrant were rejected by both schools.

Given the possibility that a student can be accepted to one or neither of the prestigious universities, we define the running variable used in the RD as follows:

\[
\text{Dist. Cutoff}_i = \text{max}\{Uchile.Dist.Cutoff}_i, \text{Catholic.Dist.Cutoff}_i\}
\]

where individuals with a Dist.Cutoff, slightly greater than zero were barely admitted to at least one of the two prestigious universities and individuals with a Dist.Cutoff, slightly lower than zero were barely rejected by both schools. For example, an individual with an Uchile.Dist.Cutoff, of −15 and a Catholic.Dist.Cutoff, of 5 was barely admitted to a prestigious university (Distinct cutoff of 5). An individual with an Uchile.Dist.Cutoff, of −5 and Catholic.Dist.Cutoff, of −20 was barely rejected by a prestigious university (Distinct cutoff of −5).

4.2. Estimation strategy

We take advantage of the information on admission scores to estimate the RD effect:

\[
t_v = E[w_v(1) - w_v(0)|\text{Dist. Cutoff}_i = 0]
\]

where *w_v(1)* is the wage of worker *i* with labor market experience level *x* if she is admitted to one of the two most prestigious university of Chile and *w_v(0)* is her wage if she is rejected by both schools. In this setting, *t_v* can be interpreted as the local average treatment effect for workers around the admission cutoff with *x* years of labor market experience.

The employer learning-statistical discrimination RD test we propose consists of estimating whether *t_v* decreases with *x*. The test is based on the assumption that a worker’s unobserved ability is correlated with being admitted to a prestigious university, but is continuous around the admission cutoff. In this framework, assuming that employers do not observe Dist.Cutoff, they will use information on college prestige to predict that workers just above the admission cutoff are more likely to be high ability. However, the wage differential between those above and below the cutoff should decline as workers gain experience and employers learn the ability of each worker.

To estimate *t_v*, we use the covariate-adjusted point estimation and covariate-adjusted robust bias-corrected inference methods developed in Calonico, Cattaneo, Farrell, and Titiunik (2019). The control variables are female, private high school indicators, major fixed effects, and year fixed effects. In addition, we use local linear polynomials with an uniform kernel function to estimate the RD parameter. In our main specification, we use mean squared error minimizing selection procedure (MSE) as our bandwidth selection process with the same bandwidths to the left and to the right of the threshold (Calonico, Cattaneo, & Titiunik, 2014). By using a data-driven bandwidth selection, we obtain different bandwidths for each experience level. We show that our main findings are generally robust to bandwidth selection methods, kernel weight function choices, and the exclusion of covariates. Finally, following Abadie, Athey, Imbens, and Wooldridge (2017), we cluster

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13 See Graetz (2017) for a theoretical model and discussion of human capital, signaling and employer learning using discontinuity regression designs.

14 This assumption does not imply a sharp RD, as students with scores above the admission cutoff can still enroll in a less prestigious school.

15 We were only able to obtain PAA weights for years starting in the year 2000. To construct final scores for individuals that took the PAA before 2000, we assume that programs used the same weights for previous years.
our standard error at the major and year, where treatment is assigned.

5. Results

First, we address the empirical question of whether the probability of graduating from one of the two prestigious universities in Chile is discontinuous at the admission cutoff. Note that it is possible that individuals with a higher score than the admission cutoff decided to attend a less prestigious university. In addition, due to transfers from less prestigious universities or athletes’ admissions, students with a lower score than the admission cutoff might graduate from a more prestigious university. Fig. 5 shows graphically the discontinuity in the probability of graduating from a prestigious university at the cutoff. Consequently, being just above the admission cutoff causes a significant increase in the probability of graduating from a prestigious university in Chile, a necessary condition for the validity of the RD design.

A potential threat to the validity of the regression discontinuity is that rejected students can retake the test until they score enough to be admitted in one of the two elite universities. If those who retake the test are different from those who do not retake, it is possible that individuals above the cutoff are not different in terms of their unobservable characteristics. Using age at college entry we test whether individuals above the cutoff are significantly older (retakers) than those below the admission cutoff. While the test can be underpowered because we only observe age at college entry for a subsample of our data, Table 3 shows that individuals above the cutoff are not significantly older at college entry than those below the cutoff. The table also presents further evidence for RD design’s validity. We search for a jump at the discontinuity for pre-treatment variables that should not be affected by the treatment. Precisely, if being above or below the cutoff is random, we should observe a zero-treatment effect on the probability of being female or graduating from a private high school (Imbens & Lemieux, 2008). The Table suggests that there is no discontinuity of these variables around the cutoff. In most specifications, we cannot reject at reasonable levels of significance that there are zero effects of being above the cutoff on these pre-treatment outcomes. The evidence of balance of pre-determined covariates across admission cutoff is consistent with the findings of other studies that have explored similar RD design in Chile (Kaufmann et al., 2012 and Zimmerman et al., 2019).

Finally, in Fig. 6 we show the empirical distribution of our running variable and test for the presence of a density discontinuity around the admission cutoff. Using the manipulation tests based on the local-polynomial density estimation technique proposed in Cattaneo et al. (2019), we do not find evidence of any

### Table 3

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Age at College Entry</th>
<th>Female</th>
<th>Private High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD Estimator</td>
<td>−0.258</td>
<td>0.011</td>
<td>−0.011</td>
</tr>
<tr>
<td>Robust 95% Interval</td>
<td>[−0.758,0.116]</td>
<td>[−0.102,0.131]</td>
<td>[−0.061,0.054]</td>
</tr>
<tr>
<td>MSE Optimal Bandwidth</td>
<td>24.47</td>
<td>36.16</td>
<td>47.43</td>
</tr>
<tr>
<td>Observations</td>
<td>3,604</td>
<td>7,735</td>
<td>9,679</td>
</tr>
</tbody>
</table>

RD estimate are based on local linear polynomials with uniform kernels estimates. Robust bias-corrected 95 percent confidence intervals are based on Calonico et al. (2014). Optimal bandwidth is obtained using mean squared error minimizing selection procedure (MSE) with the same bandwidths to the left and to the right of the threshold. Confidence intervals are based on standard errors clustered at the at the major-year level.
discontinuity in the density (t-test equal to 1.25), suggesting that students cannot precisely manipulate their scores around the cutoff. This result is not surprising given that admission cutoffs are defined by the weighted PAA score of the last admitted applicant and, therefore, students do not know the admission cutoff before their application.

Table 4 presents our regression discontinuity EL-SD test. We estimate a 13% wage premium for those just above the admission cutoff in their first year in the labor market compared to those just below the admission cutoff. However, this wage differential declines as workers gain more experience. We estimate a wage premium of 6% for workers with 2–3 years of experience, 8% for those with 4–5 years, and 4% for those with 6–10 years of experience. In addition, we cannot reject that the wage premium for those with more than 6 years of experience is statistically different from zero. Overall, while the 95 percent confidence intervals are wide in our RD estimates by experience level, the data show that workers above admission cutoffs are paid substantially more just after graduation, but this difference tends to decline as workers accumulate job market experience. We interpret this finding as evidence that employers use college prestige as a signal of unobserved ability when workers leave school but quickly learn about workers’ true productivity.

In Fig. 7 we plot the unconditional means of log annual earnings on the vertical axis and the distance from the admission cutoff on the horizontal axis for the first years of labor market experience. The open circles represent 5-point local averages, and the lines represent linear fits below and above the admission cutoff. The figure shows that there is a jump in earnings in the first year of labor market experience for workers who are just above the cutoff. This discontinuity is consistent with previous literature that finds a significant effect on earnings for being just above the admission cutoff of recent college graduates (Saavedra, 2008). However, as workers gain labor market experience, the discontinuity in earnings tends to decrease to the point that there is no apparent difference in terms of earnings between workers just above and below the cutoffs five years after graduation.

**Sensitivity checks**

To provide robustness checks for the main RD findings, in Table 5 we present estimates for the earnings discontinuity at the admission cutoff. We provide robust bias-corrected 95 percent confidence intervals based on Calonico et al. (2014). Optimal bandwidth is obtained using mean squared error minimizing selection procedure (MSE) with the same bandwidths to the left and to the right of the threshold. Confidence intervals are based on standard errors clustered at the at the major-year level. Controls: Female, Private High School Indicator, Major Dummies, and Year Dummies.

---

**Table 4**

<table>
<thead>
<tr>
<th>Experience Level</th>
<th>RD Estimator</th>
<th>Robust 95% Conf. Interval</th>
<th>MSE Optimal Bandwidth</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year after Graduation</td>
<td>0.131</td>
<td>[0.031,0.229]</td>
<td>31.4</td>
<td>3,003</td>
</tr>
<tr>
<td>2–3 years after Graduation</td>
<td>0.055</td>
<td>[0.011,0.134]</td>
<td>35.6</td>
<td>8,745</td>
</tr>
<tr>
<td>4–5 years after Graduation</td>
<td>0.078</td>
<td>[0.019,0.167]</td>
<td>18.8</td>
<td>4,450</td>
</tr>
<tr>
<td>6–10 years after Graduation</td>
<td>0.040</td>
<td>[−0.047,0.152]</td>
<td>24.8</td>
<td>2,816</td>
</tr>
</tbody>
</table>

Note: RD estimate are based on covariate-adjusted local linear polynomials with uniform kernels estimates (Calonico et al., 2019). Robust bias-corrected 95 percent confidence intervals are based on Calonico et al. (2014). Optimal bandwidth is obtained using mean squared error minimizing selection procedure (MSE) with the same bandwidths to the left and to the right of the threshold. Confidence intervals are based on standard errors clustered at the at the major-year level. Controls: Female, Private High School Indicator, Major Dummies, and Year Dummies.

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16 Cattaneo et al. (2019) test is an improved version of the McCrary (2008) as it auto-determines the bandwidth.
cutoff for different experience levels using different model specifications. Row (1) shows RD estimates with a optimal bandwidth obtained using a coverage error rate minimizing selection procedure and CER-optimal bandwidth is obtained using coverage error rate minimizing selection procedure with the same bandwidths to the left and to the right of the threshold. Confidence intervals are based on standard errors clustered at the at the major-year level. Additional Controls: Female, Private High School Indicator, Major Dummies, and Year Dummies.

5.1. Further evidence for statistical discrimination

We further investigate statistical discrimination on the basis of university prestige by following the employer learning basis of discrimination (EL-SD) test suggested by Altonji and Pierret (2001) and further developed by MacLeod et al. (2017). For this test, we use information on all college graduates, without any restriction on their scores. Our specification is:

\[ w_i = \beta_0 + \eta_i s_i + r (s_i \times \text{Exp}_i) + a (z_i \times \text{Exp}_i) + \eta_i \]

where \( z_i \) is a measure of the student’s ability. Similar to MacLeod et al. (2017), we use admission PAA test scores to measure ability, taking the average over the three compulsory tests components (math, verbal, and history and geography of Chile). To facilitate the interpretation of the coefficients, we standardize the PAA score by test year. The variable \( s_i \) is an measure of college reputation, defined as the mean PAA score of the university graduates. The traditional EL-SD test consists of estimating \( r \) and \( a \). Indeed, Altonji and Pierret (2001) propose that if employers statistically discriminate workers on the basis of \( s \) and if \( z \) is positively related to \( s \), one should find that the return on reputation to fall with experience \((r < 0)\), with return on ability rising with experience \((a > 0)\). This method has the advantage of testing employer-learning statistical discrimination for the average college graduate, not only those marginally admitted to a prestigious university. However, different from the RD test, the goal is not to identify the causal effect of reputation or admission scores. Our interest is in how their returns change with worker experience, the \( r \) and \( a \) coefficients, and whether these changes match the predictions from a statistical discrimination model (MacLeod et al., 2017).

We present the estimates of this model in Table 6. Column 1 of Table 6 reports the results of the estimation when ability is omitted, and in column 2 we add PAA scores as controls to the equation. Consistent with the signaling model, the period-zero reputation coefficient falls from 0.225 in column 1 to 0.174 in column 2. The important result is shown in column 3, where we add PAA scores interacted with experience to capture the idea that employers should increase the return on ability with time. The coefficient on period-zero reputation is 0.222, which is large and statistically significant. However, we estimate a coefficient of \(-0.017\) for the interaction between the reputation and experience and, therefore, the effect of reputation on wages decreases by 1.7% by year. Unlike MacLeod et al. (2017), our result supports the theory that reputation is a signal for unobserved ability by finding a negative correlation between earnings growth and college reputation. Finally, consistent with employers learning about ability overtime, column 3 shows a positive and significant coefficient on the interaction of PAA scores and experience showing that employers increase the return on ability as they learn more about a worker’s productivity.

6. Conclusion

This paper tested whether employers statistically discriminate based on the university prestige. We took advantage of the centralized admission process of traditional universities in Chile to propose a statistical discrimination test based on a regression discontinuity design. The

Table 5

<table>
<thead>
<tr>
<th>Regression Specification</th>
<th>Additional Controls</th>
<th>Bandwidth</th>
<th>Kernel</th>
<th>1 year after Graduation</th>
<th>2-3 years after Graduation</th>
<th>4-5 years after Graduation</th>
<th>6-10 years after Graduation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Yes CER-optimal bandwidth</td>
<td>Uniform</td>
<td>0.134</td>
<td>0.027</td>
<td>0.058</td>
<td>0.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Yes 35 Uniform</td>
<td>0.099</td>
<td>0.054</td>
<td>[-0.039,0.103]</td>
<td>[0.014,0.241]</td>
<td>[-0.074,0.192]</td>
<td>[0.017,0.196]</td>
<td>[-0.080,0.121]</td>
</tr>
<tr>
<td>(3) Yes 35 with 5 Donut-Hole Radius</td>
<td>Uniform</td>
<td>0.136</td>
<td>0.082</td>
<td>0.028</td>
<td>-0.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) No MSE Optimal Bandwidth</td>
<td>Uniform</td>
<td>0.198</td>
<td>0.016</td>
<td>0.037</td>
<td>0.041</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: RD estimate are based on local linear polynomials. Robust bias-corrected 95% confidence intervals in brackets are based on Calonico et al. (2014). MSE Optimal Bandwidth is obtained using mean squared error minimizing selection procedure and CER-optimal bandwidth is obtained using coverage error rate minimizing selection procedure with the same bandwidths to the left and to the right of the threshold. Confidence intervals are based on standard errors clustered at the at the major-year level. Additional Controls: Female, Private High School Indicator, Major Dummies, and Year Dummies.
test consists of comparing the earnings of those just above and below the admission cutoff to the two most prestigious universities in Chile. We showed that recent graduates with scores just above the admission cutoff have significantly higher earnings than those with scores just below the cutoff when they leave college. However, as workers gain labor market experience, the earnings gap between these two groups decreases. We interpret this result as employers paying workers in accordance with the prestige of their college when they first graduate from university but rewarding them based on their true productivity as they reveal their quality to employers over time.

These results shed some light on the benefits of graduating from a selective university. We interpret our findings as evidence that attending a prestigious university has a significant impact on signaling to employers a worker’s unobservable quality. However, employers learn fast and individuals tend to be paid in accordance with their true ability with time. The erosion of the earnings premium for workers with similar pre-university characteristics is evidence of signaling.

While this interpretation is consistent with the employer-learning literature, other possible theories could explain this pattern. For example, it is possible that most able individuals who graduated from a less prestigious university either learn faster on the job or make more of an effort on the job than those who went to a prestigious university.

Another theory is that prestigious universities provide better networks that help their graduates get higher-paying jobs in the beginning of their careers, but such networks disappear with time. While we cannot directly test these alternative theories using our data, we provide further evidence for the EL-SD test by following the empirical specification suggested by MacLeod et al. (2017). Consistent with employers using college reputation as a signal of employees’ unobservable ability, we find that the correlation between earnings and university reputation decreases with experience, while the correlation between earnings and scores increases with experience.

Finally, it is important to keep in mind that our results are obtained using data from Chile. While our findings are consistent with evidence of signaling effects in Israel (Lang & Siniver, 2011) and Japan (Araki et al., 2016), MacLeod et al. (2017) find little evidence for signaling effects explaining wage trajectories in Colombia. Because employers in labor markets might value college reputation differently, we hope that future research can apply our framework to test employer learning, statistical discrimination, and university prestige in other countries.

<table>
<thead>
<tr>
<th>Table 6</th>
<th>Traditional EL-SD regression.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: Log Annual Wage</td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>(1)</td>
</tr>
<tr>
<td><strong>Reputation</strong></td>
<td>0.225</td>
</tr>
<tr>
<td>(0.006)**</td>
<td>(0.006)**</td>
</tr>
<tr>
<td><strong>Reputation * Experience</strong></td>
<td>0.005</td>
</tr>
<tr>
<td>(0.002)**</td>
<td>(0.002)**</td>
</tr>
<tr>
<td><strong>PA</strong></td>
<td>0.064</td>
</tr>
<tr>
<td>(0.005)**</td>
<td>(0.008)**</td>
</tr>
<tr>
<td><strong>PA * Experience</strong></td>
<td>0.013</td>
</tr>
<tr>
<td>(0.002)**</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>307,989</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.244</td>
</tr>
</tbody>
</table>

Controls: Female, Private High School, Cubic Experience Polynomial, Major Dummies, and Year Dummies. White/Huber standard errors clustered at the individual level are reported in parentheses. PAA is the average Verbal, Math, History/Geography PAA scores (standardized). Reputation is the university-level average PAA score of students graduating from a university. **p < 0.10, ***p < 0.05. **p < 0.10.

CRediT authorship contribution statement

Paola Bordón: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. 
Breno Braga: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing.

Supplementary material

Supplementary material associated with this article can be found in the online version, at 10.1016/j.econdev.2020.101995.

References