University Quotas and Peers' Achievement

Soledad Giardili

Working Paper No. 855 February 2018 ISSN 1473-0278

School of Economics and Finance

University Quotas and Peers' Achievement

Soledad Giardili*

February, 2018

In 2012, the Brazilian government passed a law that mandated all federal higher education institutions to implement a 50 *percent admission quota for historically disadvantaged students. I study the implications of this regulation on the academic performance of non-targeted students. Identification rests on the use of pre-law crosswise variation in specially admitted student representation to instrument for exogenous changes in the student body composition afterward. Increased enrollment of targeted students due to the affirmative action caused an increase in the variance of academic ability within university programs. However, I find no evidence that quota-students affect the dropout of non-quota students.*

JEL codes: I23, I28, J15
Keywords: Education, Affirmative Action, College Admission

Affirmative action policies give preferential treatment to historically excluded individuals on the basis of an inherited or acquired trait, such as gender, race or income class. The aim is to level the playing field and compensate for past discrimination in the political, economic and educational arena. In the higher education sector, which is the context of this study, these policies are usually implemented by setting quotas to widen the access of students who are disproportionately less likely to enroll in college.

*Giardili: School of Economics and Finance, Queen Mary University of London, Mile End Road, London, E1 4NS (email: s.giardili@qmul.ac.uk). I am grateful to my advisors Erich Battistin and Francesco Fasani for their guidance on this project. I also thanks Barbara Petrongolo, Marcos Vera Hernández, Amanda Arabage and participants at QMUL seminars for useful comments and suggestions. I thank the National Institute for Educational Studies and Research (INEP) for facilitating access to the data and in particular, to Marcella Marjory Massolini Laureano Prottis, Célia Maria Guimarães Anchieta and Marcelo Pardellas Cazzola for their cooperation and help during my visit at the INEP. This work received support from Queen Mary Postgraduate Research Fund (QMPGRF) and the Society for Latin American Studies Postgraduate Travel Grant.

As is common in situations of scarce resources reallocation, affirmative action (AA) policies are not uncontroversial. Vigorous debates were held on this topic in countries where these policies are an established practice, like India, or where they become banned by court rulings, like the US. Contributing to the debate on preferential admission treatment, there was a proliferation of studies discussing the policy effectiveness concerning both the extensive and the intensive margin. This means, on the one hand, assessing to what extent AA policies reduce the gap in the access to education between minority and non-minority students and, on the other hand, evaluating whether intended beneficiaries are well suited academically (the so-called "mismatch" hypothesis). It may be the case that these policies actually harm targeted students by placing them in challenging environments, for which they are poorly prepared.[1]

This paper provides a contrast to the existing literature on AA programs by focusing on a rather neglected dimension. In particular, I study how the inflow of specially admitted students (quota students hereafter) affects the academic performance of their non-quota peers. I exploit a natural experiment in student composition caused by the *Lei das Cotas* in Brazil, a regulation that mandates all federally-funded higher education institutions to meet a 50 percent admission quota in a period of four years. At the time the bill passed in 2012, quota students represented 13.3 percent of the college population enrolled in federal universities, with a large dispersion across institutions as shown in Section IB.[2]

The college admission process, the design of the AA program and the access to rich data provide important research advantages. First, Brazilian universities have a forthright admission process determined solely on the basis of a competitive entrance examination. There are no subjective assessments of the students through recommendation letters, essays or interviews, like in the settings where most research on AA policies has been conducted. This fact allows to determine precisely how the implementation of quotas impacts the quality of admitted students. Second, the law affected federally funded universities, which are the most prestigious providers of tertiary education in Brazil. The fact that these are disseminated across all regions of

[1]See, for example, Bowen and Bok (1998), Long (2004), Hinrichs (2012) and Epple, Romano, and Sieg (2006) for the effect of affirmative action bans or switches to race-neutral on minority college enrollment is the US context. With respect to whether these programs actually help their intended beneficiaries, see Sander (2004), Alon and Tienda (2005), Rothstein and Yoon (2008) and Bagde, Epple, and Taylor (2016). This reference list is not exhaustive but represents some of the most relevant works on these topics. For an extended review of the empirical work on affirmative action see Arcidiacono and Lovenheim (2016).

[2]This paper uses the terms "higher education institutions", "colleges" and "universities" interchangeably.

the country strengthens the external validity of this study's findings. On the contrary, most studies on higher education are based on observations from a single or a few geographically clustered institutions. Last, the data allow to identify which students access education through the existence of quotas, while this is usually inferred in other settings. For example, studies for the United States use ethnicity to categorize quota students.[3]

To estimate the effect of quota students inflow I use the pre-law cross sectional variation in quota student representation as an instrument for the change in the share of quota students across programs of study, in the spirit of Stevenson (2010), Ahern and Dittmar (2012) and Bertrand et al. (2014). The use of an instrumental variables (IV) strategy is motivated by the fact that the constraints faced by each university on the admission of quota students depended on the quota policy in place before the law was announced. That is, institutions with a high proportion of quota students prior to regulation were required to make fewer changes to comply with the law compared to those with non-existent AA program or a small numbers of quota students enrolled.

There are a number of challenges related to the exclusion restrictions needed to interpret two-stage least squares (2SLS) estimates. To begin with, implicit in the identification strategy is the assumption that the pre-law quota student representation was not impacted before the enforcement of the law. Conceptually, any anticipatory effect makes more difficult to find an effect of the reform and, at the same time, render the instrument endogenous. Consequently, I use the share of quota students in the 2011 cohort, one year before *Lei das Cotas* was passed, when forward-looking behaviors are less likely. Similarly, the causal interpretation of the results is potentially muddled by two facts: (i) a spurious correlation between the quota students representation pre-reform and the posterior changes in the academic performance of non-quota students—unrelated to the inflow of quota students—and (ii) a contemporaneous composition effect of the non-quota students population. I provide suggestive evidence against the first limitation and rule out composition effects by restricting the analysis to high-achievers non-quota students. In Section III.C, I further assess the robustness of the IV estimates using an alternative identification strategy that controls for differential time trends.

I show that the increase in the representation of quota students among universities was sharp. However, I find no evidence of an incremental effect on the dropout probability of non-quota students. Furthermore, for the group of high-achiever non-

[3]India provides a similar setting to the one described for Brazil in terms of admission process and aggressive affirmative action policies. See Bagde, Epple, and Taylor (2016) for a detailed description of the caste-based affirmative action policy in higher education in India.

quota students the results are negative, meaning that, if anything, they drop out less the higher is the share of quota student in the same study program. Results are in line with Guryan (2004), who finds no dropout effect of white students after the implementation of high school desegregation plans in the United States during the 1970's. One possible interpretation of these finding, given the aggressiveness of the policy, is that college dropout may be less sensitive to peer composition than to individual background characteristics (Evans, Oates, and Schwab, 1992).

The first contribution of this study is to the affirmative action literature. Mixed evidence of the effect of minority exposure on earnings of non-intended beneficiaries can be found on Daniel, Black, and Smith (2001) and Arcidiacono and Vigdor (2010). A potential explanation is that both studies are based on college-level variation in the share of black students from relatively different set of institutions in terms of selectivity. Regarding test performance, studies based on highly selective environments report detrimental effects of incumbents over their peers (Lu, 2014; Sekhri, 2011). In Brazil, empirical research evaluating the effect of affirmative action is mostly concerned with application incentives (Carvalho and Waltenberg, 2012; Estevan and Thomas Gall, 2016), reduction in admission gaps (Mendes Junior, Souza, and Waltenberg, 2016) and academic performance of beneficiaries (Francis and Tannuri-Pianto, 2012; Childs and Stromquist, 2015). Less is known about the impact of a more diverse college environment on non-quota students besides the work of Silva (2014), who reports negative correlations between being exposed to quota students and the college performance of non-quota for a period pre *Lei das Cotas*. I complemented this work by providing a different research strategy to interpret and estimate the causal impacts of the effect of quota students on their non-quota peers.

This paper also contributes to the peer effects literature in higher education. It is usually the case that students with similar characteristics join the same institutions, or that the admission committees use common unobserved attributes in choosing students (Sekhri, 2011). This implies that the student body composition may be correlated with unobserved individual traits or institutional level components (Arcidiacono and Vigdor, 2010). In order to identify causal effects, scholars have exploited the random assignment of students to classroom in military academies (Lyle, 2009; Carrell, Fullerton, and West, 2009) or to college's dormitories (Sacerdote, 2001; Zimmerman, 2003; Boisjoly et al., 2006). However, these groups pose an external validity problem as it may be the case that students in military academies are not representative of the average college student body, or that a student's network extends beyond their roommates (Stinebrickner and Stinebrickner, 2006; Carrell, Fullerton, and West, 2009). By contrast, the change in the admission policy imposed by the affirmative action regulation in Brazil provides an opportunity to study the peer effect among

regular college students.

The remainder of the paper proceeds as follows. Section I presents the main features of the higher education sector in Brazil and the quota regulation affecting federal universities. Section II describes the data sources and provide some descriptive analysis characterizing the type of diversity brought about by the policy. In Section III, I lay out the identification strategy, provide results of the effect of quota students on the dropout of non-quota students and, additionally, document the robustness of the estimates. Section IV concludes.

I. Background and Institutional Context

A. *The Higher Education Sector in Brazil*

The higher education sector in Brazil consists of private and public institutions. Public providers are institutions established and funded by the federal, state (provincial) or municipal governments. By 2015, only about an eighth of the 2,364 tertiary institutions were public but they account for 27.5 percent of the students enrolled.[4] Among the public universities, institutions (and student shares) are distributed as follows: 36(62.1) percent for federal, 41(31.5) percent for state and 23(6.4) percent for municipal universities.

Tertiary institutions offer three types of programs with varying duration. The bachelor and the licentiate degree programs last on average between 4 to 6 years, the technical degrees are shorter and last 2 to 3 years.[5] The distribution of degree-seeking students across these programs in 2015 was 76.9 percent for bachelor, 13.7 percent for licentiate and 9.3 percent for technical degrees.

Students choose the program of study they wish to join in the application stage, before they know if they are accepted. They need to take an entrance exam to be considered for admission and everyone with a score above the program specific cut-off get a place. No subjective assessment of student's quality is required in the admission process. Historically, each university created and administered their own non-standardized entrance exam, called *vestibular*. However, after the implementation of a centralized system for public university admissions commissioned by the Ministry of Education in 2009, most federal and state universities replaced their traditional

[4]Unless otherwise indicated, all statistics reported though out this section come from the Statistical Synopsis of Higher Education (INEP, 2015).

[5]The difference between bachelor and licentiate programs is that the latter allow the graduates to immediately qualify as teachers at the primary and secondary levels. Technical degrees offer specialized training in scientific and technological areas.

and specific entrance examination by the standardized National High School Exit Exam (ENEM) to admit students.[6]

Public universities, with the exception of the municipal ones, are tuition free and provide the most high-quality education. This can be seen in **Figure 1**, which shows the distribution of the program's quality scores (known by its Portuguese acronym CPC) by institution type throughout 2010-2015.[7] Consistently, both federal and state distributions lie equally skewed towards the upper distribution limit, far apart from the Private and Municipal ones. As a consequence, these higher education institutions (HEIs) face an intense competition for admission with an average candidate per vacancy ratio of 16, compared to 1.7 in private institutions.

Similar to other countries in the region, student mobility in Brazil is low and access to post-secondary education has been particularly unequal. In general, fewer than 10 percent of the students come from a state different from where the university is located and only about 5 percent of the enrollment belonged to the bottom two income quintiles (World Bank, 2000).

B. *Affirmative Action Policies and the "Lei das Cotas"*

Public higher education institutions in Brazil have been implementing affirmative action policies for more than 15 years. State-funded universities were the pioneers, soon followed by the federally-funded ones, albeit at a slower pace.[8] Although race has been the overriding factor determining special admission, HEIs gradually moved from a race-based affirmative action policy to a poverty preference admission program.

In August 2012, the government passed a law, known as *Lei das Cotas*, to set a 50 percent quota in each affirmative action program run by federal universities. The students targeted by this reform should be selected based on multiple disadvantage criteria in the following order of priority: (1) being a graduate from a public secondary school, (2) being a member of a low-income family, and (3) belonging to an

[6] As universities implemented this clearinghouse (known as SISU) in different years, one concern is the extent to which this reform affected the student body composition and make estimates subject to omitted variable bias. To address this concern, I requested to the INEP the list of participating institutions through time. Controlling for the timing in the adoption of the centralized system do not alter the estimated effects, as shown in Section III.B. See Machado and Szerman (2016) for a first study that examine the effect of the clearinghouse implementation on the sorting and migration of students.

[7] The Preliminary Course Program Score (CPC) is an indicator created by the Ministry of Education in Brazil to evaluate the quality of undergraduate study programs and guide public policy initiatives in higher education.

[8] The implementation of such policies were the result of either local state laws or by approval of each university council. For a review of the historical process of AA programs see Valente and Berry (2016).

underrepresented race.[9] A flow chart in appendix A shows in detail the breakdown of the quota between these layers. Note that the first layer for eligibility is being graduated from a public high schools, reflecting the disadvantages in university access faced by those students that could not afford private schooling. This is due to the better quality services of private providers in the primary and secondary level, opposite to what happens at higher education.

After the law passed, the federal HEIs had a maximum of 4 years to comply with the 50 percent representation of deprived students. The quota implemented annually is at the discretion of each institution, provided that a minimum of 12.5 percentage points increase is instituted each year. In particular, the reform mandated the institutions to implement a quota of at least 12.5 percent in 2013, 25 percent in 2014, 37.5 percent in 2015 to finally reach 50 percent by 2016. To put these magnitudes in perspective, **Figure 2** shows the share of quota student by institution in 2011, one year before the law was passed, and the minimum thresholds required up to 2015, which is the last year of data available. In 2011, 46 percent of the federal universities had no representation of specially admitted student within their student body. For the remaining 54 percent, it can be observed a huge dispersion, with an average quota student share of 16.7 percent.

Importantly, the law specified that the quota should be implemented uniformly in each program of study offered, preventing the HEIs to deliberately exclude quota students from certain academic areas. Even if a program of study is run parallel at branch or a satellite campus, or is offered at different shifts (morning, evening, integral, night), the institution should apply the quota in each of them.[10] In addition, to guarantee fulfillment of the quota regulation, the law mandates that the higher education institutions would be monitored and evaluated by a committee composed by members from the Ministry of Education as well as representatives from institutions that promote racial inclusion in Brazil (and that are linked to the Ministry of Justice).

The public debate on affirmative actions in higher education in Brazil was always heated and mainly circulated around the constitutionality of using race or ethnicity to determined eligibility. Since 2009, the Democratic Party was advocating the suspension of the admission quota for black students at the University of Brasilia, alleging violation of Article 5 in the Brazilian Constitution, which protects equality for all citizens regardless of race. Finally, on the 26th of April 2012, the Federal Supreme

[9]Race in Brazil is defined by self-declared skin color. The quota policy considered students identified as preto (black), pardo (mixed race) or belonging to the indigenous population.

[10]If universities strategically allocate quota students to certain (but not all) programs of studies to comply with the quota regulation, the predictive power of the instrument could be affected.

Court declared the constitutionality of racial quotas in public universities. The press reported about a draft bill mandating a 50 percent quota only after the court ruling, and in exactly 4 months, on the 29th of August, the law was passed. The speed of these events suggests that the quota regulation was issued without an informed consent, especially in terms of eligibility and timing, of the federal universities, and thus it imposed a substantial constraint on admission criteria.

II. Data and Summary Statistics

A. *Data*

The data for this study come from two different sources: the National High School Exit Exam (ENEM) and the Higher Education Census. The first one contains students' information at pre-university stage while the census provides information on students enrolled in higher education. Individual records from the two datasets were linked using the student' unique identifier.[11]

ENEM was created by the Brazilian Ministry of Education to assess the competences of high school graduates. It is a national standardized test taken at the end of the academic year and consists of multiple choice questions for four different subjects (Sciences, Humanities, Portuguese and Math) and a written essay. Although it is non-mandatory, participation in this standardized test has been increasing and widening to become the second largest in the world, with 6 million test-takers in 2016.[12] Since 2009, after the exam was reformulated, many universities adopted it—partially of fully replacing the *vestibular*—to determine admission to higher education.[13] The ENEM dataset contains a rich set of predetermined attributes of college-seeking students: students' scores (standardized to have zero mean and standard deviation of one across all test-takers), demographic characteristics and family background variables.

The Higher Education Census has traditionally collected information on higher

[11]These identifiers are not publicly available but access was granted by the National Institute for Educational Studies and Research (INEP). The identification number for each student is the individual taxpayer registry number (*Cadastro de Pessoas Físicas*), which is uniquely assigned to each individual in Brazil for tax collection and social security purposes.

[12]The number of test-takers exceeds the number of high school graduates in 2015. This may by due to the fact that participation is also possible for those that graduated in previous years and for those above 18 years old that, even though did not completed high school, intend to use it as a certificate of completion.

[13]By the time, the ENEM was very popular among private institutions but less for public ones. Some state and federal adopted it as the sole entrance exam while others use it as a partial requirement for the admission process together with their own *vestibular* exam.

education institutions in Brazil and the programs of study they offered. Since 2009, the census incorporated individual-level data on students, allowing to identify in which program-college the student is enrolled, the enrollment date, if the student was specially admitted through a quota system and the student status at university (enrolled, graduate, dropout).

B. *Sample Selection and Outcome*

The main sample consists of freshman non-quota students enrolled in federal HEIs in six consecutive cohorts between 2010 and 2015.[14] Student cohorts are defined by enrollment year.

I link students in each cohort with their test scores in the High School Exit Exam (ENEM) the previous year.[15] The ENEM dataset used for this procedure ranges from 2009 to 2014. I am able to match 80 percent of the students.[16] Summing up, the final sample consists of $1,159,588$ non-quota students enrolled in 101 federal HEIs. As shown in Appendix B, the matching rate per year increased over time as ENEM becomes adopted for university admission. Importantly, when considering the whole student population by including quota students (Panel B,**Table B1**), the matching rates remain at similar levels, i.e., there is no systematic differences in the quality of the matching by students' special admission status.

The outcome measure of student academic progression is *dropout* in the first year, which is usually the college stage in which dropout rate hit high. This is a variable available from the census data and is recorded at the end of the academic year (December). The *dropout* indicator takes value one if the enrollment situation is on leave or canceled, and zero otherwise.

C. *Descriptive Statistics*

The representation of quota students at federal universities has grown remarkably, rising from about 11 percent for the 2010 cohort to 33 percent for the 2015 cohort. This

[14] I exclude students from the *Instituto Tecnológico de Aeronáutica* and the *Instituto Militar de Engenharia* because, even though they are federally-funded, they are exempt from the *Lei das Cotas* as they do not depend on the Ministry of Education. I also exclude students from distance learning programs, as they usually face lower peer interaction and may not represent the average student population. Among federal institutions, the representation of student enrolled in distance learning programs is about 6.7 percent.

[15] As all the student in the sample are freshmen, the term cohort can be used interchangeably with year.

[16] Unmatched students may comprise some individuals that took the ENEM in previous years and others that got access to study programs through *vestibular* score only.

can be seen in the first row of **Panel B of Table 1**. This table provides cross sectional mean values and standard deviations for faculty (Panel A) and non-quota student (Panel B) characteristics between 2010 and 2015. Faculty members are slightly more likely to be male and white with average age approaching 44 years old. The different measures of educational attainment (master, PhD) and contractual employment schemes (from full-time to hour contract) of the college staff are substantively similar across years. There is also no appreciable change to the demographics of non-quota students enrolled in federally-funded universities over time, from before to after the reform. These students are mostly single, residing in urban areas and average 23 years old. Around 30 percent have high-educated parents and they are equally likely to be female or male. Neither the share of students that born in a municipality or state different from the college's location nor the distribution of students across programs of study areas exhibit any particular trend.[17]

There are, however, some notable differences in the academic background of admitted non-quota students over time. This can be seen in **Figure 3**, which shows the distributions of ENEM scores among non-quota students across cohorts. The figure is obtained by plotting the density of the total ENEM score (averaging the five components of the exam: Sciences, Humanities, Portuguese, Math and writing essay) of non-quota students at federally-funded institutions by year. The fact that the distribution shifts further to the right as time passes—and especially when the minimum quota threshold requested by the AA regulation becomes larger—suggests that the displaced non-quota students (applicants that do not get a place in virtue of the policy) belonged to the middle and lower end of the score range.

Comparing students over the period 2010-2015, it can be observed that quota students have an average admission test score below the one for non-quota students. **Figure 4** plots the distributions of ENEM scores for students enrolled in federally-funded institutions by cohort. Distributions for quota and non-quota students are shown separately. Although there is substantial overlapping, the distribution for non-quota students lies to the right of the one for quota students in all the years, and the gap becomes more pronounced in the law period (2013-2015).[18]

[17]Appendix C reports the same descriptive statistics considering only faculty and non-quota students from state-funding institutions.

[18]Figures in Appendix C shows the same distributions for each of the components evaluated in ENEM exam.

III. Impact on non-quota Students Dropout

A. *Empirical Strategy*

I relate changes in the share of quota students to the academic performance of non-quota students using the following specification:

$$y_{icp} = \beta_0 + \beta_1 QSS_{cp} + \gamma_c + \gamma_p + \epsilon_{icp}, \tag{1}$$

where y_{icp} is the *dropout* variable for non-quota student i in cohort c of program of study p. Subscript p is a shorthand notation for university-program-shift cell. Here and elsewhere, the terms γ_c and γ_p represent cohort and program fixed effect and control for the average cohort and program of study differences in non-quota student outcome. The variable QSS_{cp} denotes the share of quota students in the same cohort-program cell and the parameter β_1 can be interpreted as the percentage point change in the probability that a non-quota student drops out from college when there is a unit change in the representation of quota students. All standard errors are clustered at the university level.[19] In estimating (1), I include cohorts starting higher education from 2012 to 2015.

To identify the causal effect of the quota student inflow, I use the pre-law quota student representation as an instrumental variable, following the approaches of Stevenson (2010), Ahern and Dittmar (2012) and Bertrand et al. (2014). All these studies deal with institutions that have some freedom over the timing of compliance of regulations mandating a higher female representation, and used the pre-law representation as an instrument to capture exogenous variation in imposed changes.[20] Intuitively, institutions that started with a larger representation of intended beneficiaries were required to make smaller changes to comply with the mandated quota, in comparison to those institutions that initially had a lower share.

A graphical representation of the relationship between pre-law quota student share and the share in subsequent years is shown in **Figure 5**. As in **Figure 2**, the x-axis represents the ranking in the share of quota students by university in 2011, while the y-axis represents this same share for the years 2013 (Panel A), 2014 (Panel B) and 2015 (Panel C). The horizontal lines coincide with the law minimum thresholds per year of 12.5 percent for 2013, 25 percent for 2014 and 27.5 percent for 2015.

[19] Clustering by university accounts of serial correlation among different programs of study in the same institution.

[20] In Stevenson (2010), a law mandates gender parity in sport participation in US high schools. In Ahern and Dittmar (2012) and Bertrand et al. (2014), a law required all Norwegian public-limited firms to increase the participation of women on the board of directors to 40 percent.

The graphs show that the higher the ranking in 2011 (more representation of quota students) the smaller the change in the share of quota student to comply with the law during 2013-2015. They also reveal the institution heterogeneous response to the new quota regulation, with some low ranked universities (less representation of quota students) admitting a high share of quota students since 2013 while others increasing the share in a gradual manner.

Formally, the first stage equation is as follow:

$$QSS_{cp} = \delta_0 + \delta_1 QSS_{2011p} \cdot \mathbb{1}(cohort = c) + \gamma_c + \gamma_p + \eta_{cp}, \tag{2}$$

where QSS_{2011p} is the share of quota students in 2011, a year before the *Lei das Cotas* was passed, which is interacted with cohort fixed effects.[21] Alternatively, I use the distance between the share of quota students in 2011 to the minimum thresholds imposed by the law, captured by ζ_c in the equation below.[22]

$$QSS_{cp} = \theta_0 + \theta_1 (QSS_{2011p} - \zeta_c) + \gamma_c + \gamma_p + \upsilon_{cp}. \tag{3}$$

In order to test the consistency of the estimations, I first check that the estimates are robust to the gradual inclusion of set of covariates. Individual level controls include gender, age, disability status, indicators for father and mother with college degree and a proxy for academic ability at entrance: the student high school test score. The program-level covariates are: the number of slots, the workload (hours required to complete the program of study) and a dummy indicating participation on centralized admission system (SISU). The last set of covariates consists of state-specific geographic trends. I also test the robustness of the results using a triple-difference specification. This alternative identification strategy, presented in Section IIIC, uses students enrolled at state institutions as a further control group.

B. *Results*

The 2011 quota student representation is a strong predictor of the changes in the share of quota students, as shown in **Table 2**. This table reports first stage estimates.

[21] Although the share of quota students can be computed from year 2009 onwards, when the Higher Education Census incorporated individual level data, I use as instrument the share of quota students in 2011 due to the following reasons: (i) as mentioned in Section IB, the implementation of AA policies in federal HEIs was increasing over time and the more we move further back in time, the more we lose variability; and (ii) for the year 2009, in particular, it is not possible to identify in which shift (morning, evening, integral, night) the student is enrolled, which defines the peer's cell of observation in this paper.

[22] The distance instrument take value 0 for the year 2012.

Panel A shows estimates when using the interaction instrument as defined in (2), while results based on the distance instrument, as defined in (3), are shown in Panel B. In each column, the dependent variable is the share of quota students in a given cohort-program of study cell. Column 1 reports results of a parsimonious specification when no controls are included besides program and cohort fixed effects. Columns 2 and 3 include a set of students and program characteristics as described in the previous section. The preferred specification, reported in Column 4, includes state-specific time trends to capture unobserved regional characteristics that evolve over time.

Throughout columns 1 to 4 of **Table 2**, the coefficients remain significant (at the 1 percent level) and almost constant (with an average point estimate of around -0.55). The negative point estimates imply that the lower the representation of quota student in 2011 in a given program, the larger the increase in the share of quota students, in comparison to those with higher share of quota student before the law was passed. The stability of the coefficients alleviate concerns that the pre-law quota student representation is capturing other time-varying student and program attributes. The fact that results are robust to the gradual inclusion of additional control variables leads me to consider only the final specification in what follows.

In order to test that the relationship described above reflects changes induced by the *Lei das Cotas* and no other trend related to a wide adoption of affirmative action policies in selective universities, I conduct a placebo test. In particular, using the fact that state-funded universities are similar in quality to their federal counterparts but exempted from the new quota regulation, I estimate (2) and (3) using only students enrolled at state institutions. Note that, although not required to do so, state universities may have voluntary chosen to increase their affirmative action quotas. Nevertheless, if this is the case, we should observe a significant smaller effect than the one for federal universities. Results of this placebo test are presented in column 5 of **Table 2**. For this sample, the relationship between quota student representation in 2011 and the changes in the share of quota students in the subsequent years does not hold. The point estimates for students at state universities show a similar pattern to those enrolled in federal institutions, but the magnitudes are much smaller and not always significant (and with F-statistics equal to 2.630 and 2.342 for the instruments in Panel A and Panel B, respectively). As anticipated, this may reflect the fact that these state universities choose to meet an informal quota with time, albeit low.

Table 3 reports estimates of quota student share on non-quota student dropout. OLS estimates (column 1) suggests that, on average, a unit change in QSS generates a 0.068 percentage point reduction in the probability that a non-quota student dropouts from college. The magnitude of the estimated coefficient for the reduced-form specifications ranges from 0.04 for the distance instrument (column 2) to 0.06

(averaging the 3 cohort effects) for the interaction instrument (column 3). With only one exception, all of these coefficients are insignificant. Note that for the reduced-form estimates, the 2012-related variables were omitted so treatment effects are relative to the period immediately prior the regulation came into force. This means that, compared to the 2012 dropout, the probability that a non-quota student back out from college during 2013-2015 is not statistically different in those programs more impacted by the law than in those less affected. The 2SLS estimates (columns 4 and 5) also show no significant effect on non-quota student dropout probability. The fact that the increase in the representation of quota students does nothing to the dropout rate of non-quota students presumably reflects that dropout decisions are more related with background characteristics of the student (i.e. low achievement) and less sensitive to peer composition.

One potential concern to the validity of this analysis is the fact that although the change in quota student representation mandated by the law vary according to the pre-quota share, the share of quota students in 2011 is not random. For example, if the share in 2011 is related with subsequent changes in academic performance of non-quota students, by means unrelated to changes in the quota student representation, we will be in the presence of spurious correlations. To examine this issue, I compare the student population, faculty and institution characteristics of federal universities with a quota student representation in 2011 below and above 12.5 percent, the minimum threshold for 2013.

Results of this balance test are presented in **Table 4**. Institutions with a low share of quota students in 2011 are more likely to be located in the north region and have a smaller size. There is no difference between the two groups in terms of faculty educational level, research budget and work stability. Notably, dropout of non-quota students is not statistically different between the groups, as shown in the last row of the table.[23] Although this comparison does not directly test the exogeneity of the instrument, it does provide suggestive evidence supporting the identification strategy.

C. *Alternative Identification Strategy*

I test the robustness of the baseline findings using a triple-difference approach. In a difference-in-difference strategy one may compare student's outcomes at federal universities facing different constraints on the admission of quota student (i.e. the share of quota students in 2011 is below or above 12.5 percent), before and after the

[23]In results not shown here, I use instead the distance between the share in 2011 and the 12.5 threshold as the running variable. Estimates are virtually identical.

reform. But based on the fact that state universities are similar in quality to their federal counterpart but left untargeted by the quota law, I adopted a triple-difference estimation strategy using non-quota students in state institutions as a further control group.[24] In other words, I compare the difference-in-differences estimates describe above across university types (federal versus public).

There is a number of reasons that motivate this test. On the one hand, it alleviates concerns about unobserved trends related to: (i) changes in dropout rates of universities with an initial small representation of quota students (and that are unrelated to the *Lei das Cotas*); and (ii) changes in dropout rates of students attending federal universities due, for example, to other regulations specific to this sector. On the other hand, the difference-in-difference estimate, which mimics the reduced-form of the IV approach, provides a coefficient that is interesting in its own right. Consequently, adding an extra control group would make the estimation of the impact of the affirmative action program more robust.

Formally, I estimate the following equation:

$$\begin{aligned} y_{icp} \;=\; & \lambda_1 Federal_p + \lambda_2 Post_c + \lambda_3 (QSS_{2011p} < 12.5) + \lambda_4 Federal_p \cdot Post_c + \\ & \lambda_5 Federal_p \cdot (QSS_{2011p} < 12.5) + \lambda_6 Post_c \cdot (QSS_{2011p} < 12.5) + \\ & \lambda_7 Federal_p \cdot (QSS_{2011p} < 12.5) \cdot Post_c + \mu_{icp}, \end{aligned} \tag{4}$$

where y_{icp} is the *dropout* variable for non-quota student i in cohort c of program p. $Federal_p$ is a dummy variable taking value one for study programs offered by federally-funded institutions and 0 for those offered at state-funded universities. $Post_c$ is an indicator variable for the post-regulation period (2013-2015) and $(QSS_{2011p} < 12.5)$ is an indicator of whether the share of quota student in program of study p in 2011 is below 12.5 percent. The main coefficient of interest in (4) is the parameter on the triple interaction, λ_7, which measures the differential change in dropout by students in federal universities with initial low share of quota students, after adjusting for trends using students in state-funded universities. In order to check if there exist differential effects over time, I also estimate an analogous event study replacing the $Post_c$ indicator with the full set of cohort dummies.

As distinct preexisting dynamics of the outcome variable may be a concern, I show first that there is no differential trend in dropout before the *Lei das Cotas* came into effect. The results of this exercise can be seen in **Table 5**. I test the parallel trend

[24] For the state universities sample, about 63.6 percent of the student population was matched with their corresponding high school exit exam score, tallying 440, 886 students enrolled in 97 state HEIs.

assumption in two different ways: using a constant linear time trend (Panel A) and using cohort (year) dummies (Panel B). In the latter case, 2010 cohort dummy was omitted. The first four columns of **Table 5** are based on a difference-in-difference specification while the last two columns are based on a triple-difference specification as defined in (4). In columns 1 and 2, I restrict the sample to federal universities and define treated students as being enrolled in federal institutions with a representation of quota students in 2011 below 12.5 percent. In columns 3 and 4, I include in the sample students at state institutions and define treated students as those enrolled in any federally-funded universities. Finally, columns 5 and 6 combines both treatments, testing if the difference in dropout of non-quota students enrolled in federal institutions with low and high quota student representation parallels the difference for the state universities in the pre-regulation period. The difference between odd and even columns is that in the last ones the $Federal_p$ indicator is replaced by institution fixed effects. The point estimates in either of the panels are not statistically different from zero suggesting that treatment and control experienced similar trends in the dropout of non-quota students in the three years prior to the law.

Table 6 reports triple-difference estimates based on (4). Columns 1 and 2 correspond to the specification that considers the whole period 2010-2015, being 2010 the reference year. Columns 3 and 4 show estimation results for the 2012-2015 period, fully consistent with the main instrumental variable specification. While in columns 1 and 3 I use $Post_c$ variable to capture the aggregated effect from 2013 to 2015, in columns 2 and 4 I disaggregate the effect using instead cohort (year) dummies. Conclusions from this alternative specification are coincident with those using the instrumental variable approach. Again, there does not seem to be any evidence that the increased share of quota students in selective university affected the dropout of their non-quota peers.

D. *Coincident Changes in Non-quota Students and Supply*

An obvious concern with the interpretation of the results in Section III.B is that the allocation of slots to specially admitted students could have produced a change in the composition of non-quota students. For example, it could be the case that the AA program discourage applications of non-quota students that otherwise would enroll in federal universities, and that the incomers' hazards of dropping out balanced each other when exposed to quota students.

To assess this, I check whether non-quota students systematically differ across cohorts by using the benchmark instrumental variable specification. Non-quota students' demographics seems to remain stable across cohorts except for entry

qualifications. This is apparent from **Table 7**, which shows the reduced-form specification replacing the dropout dummy in the left hand side with student's predetermined characteristics. From columns 1 to 10, it is possible to observe that gender, age, race or parent's education are orthogonal to the inflow of quota students. However, columns 11 to 16 confirm the graphical evidence shown in **Figure 3**. non-quota students seems to be more academically prepared during 2013-2015, as shown by the significantly higher ENEM scores, especially in the Math and the writing essay subjects.

I then report estimates from specifications identical to those used to construct estimates in **Table 3**, but for the sample of high-achievers non-quota students (those with a high school exit exam score above the median within the cohort-cell). This last exercise is motivated by the idea of focusing the analysis on a more similar and homogeneous group of students, comparable over time. Results are in line with the earlier documented impact using all non-quota students and presented in **Table 8**. Paralleling **Table 3**, column 1 reports OLS estimates, columns 2 and 3 report the coefficients from the reduced-form specification while the last two columns present 2SLS estimates. Point estimates for the IV approach are of the magnitude of 0.22 percentage points for the interaction instrument (column 4) and of 0.15 percentage points for the distance instrument (column 5). Only the first coefficient is significant (at the 10 percent level) and negative indicating that, if anything, the increase in the share of quota students reduces the dropout probability of non-quota students.

Finally, I assess whether there are coincident changes to the quota regulation coming from the supply side. For example, higher education institutions may adjust to the inflow of quota students by hiring or retaining highly qualified staff. To explore this, I use the reduced-form specification, as in the first exercise in this section, but placing in the left had side university staff characteristics. Results are shown in **Table 9**. With the exception of age, there seems to be no significant measurable impact of quota student inflow on faculty attributes.

Several competing hypothesis reconcile the results in this section. The fact that universities do not seem to respond to the quota regulation by changing the composition of the staff may suggest that the mechanism behind the negative effects on dropout for high-achievers non-quota students operates inside the classroom. For example, professors may adjust the level of the course materials to match the new diversified student body. If dropout is mainly determined by academic performance, then non-quota students would performed better and drop out less. Alternatively, it could also be the case that there is no particular change within the classroom, but professors use curves to grade exams. If high-achievers gain the very top grades, the pattern of high-performance and low-dropout is repeated. Future research needs to

probe these channels further.

IV. Conclusions

I estimate the effect of quota student inflow on the academic performance of their peers by exploiting variation in the representation of specially-admitted students before the Brazilian government passed the *Lei das Cotas* in 2012. The analysis extends the empirical evidence on affirmative action and peer composition in higher education by: (i) using the full set of selective universities in the country; (ii) providing evidence on how quotas reshape the composition of students in terms of pre-determined academic ability; and (iii) focusing the analysis to those not directly targeted by the policy, the non-quota students.

I find no evidence of a detrimental effect of the inflow of quota students on the dropout of non-quota peers or, if anything, the effects are negative (for high-achievers students). The results do not necessarily imply that affirmative action, by placing historically underrepresented students in high pressure context, have no consequences on non-quota peers. Taken together, results suggest that dropout is less sensible to changes in the student body composition than to individual characteristics, in line with the evidence presented for high school students by Guryan (2004).

A natural direction for further research is evaluating the effect of the quota student inflow on college test scores. Brazil is one of the few countries that has a national standardized college exit exam to assess students' performance before graduating (known as ENADE). However, the cohorts affected by the quota regulation are too young to be at their last year of their program of study and prevents me including this outcome variable in this paper.

References

Ahern, Kenneth R. and Amy K. Dittmar (2012). "The changing of the boards: The impact on firm valuation of mandated female board representation". In: *The Quarterly Journal of Economics* 127.1, pp. 137–197.

Alon, Sigal and Marta Tienda (2005). "Assessing the "mismatch" hypothesis: Differences in college graduation rates by institutional selectivity". In: *Sociology of education* 78.4, pp. 294–315.

Arcidiacono, Peter (2005). "Affirmative action in higher education: How do admission and financial aid rules affect future earnings?" In: *Econometrica* 73.5, pp. 1477–1524.

Arcidiacono, Peter and Michael Lovenheim (2016). "Affirmative Action and the Quality-Fit Trade-off". In: *Journal of Economic Literature* 54.1, pp. 3–51.

Arcidiacono, Peter and Jacob L. Vigdor (2010). "Does the river spill over? Estimating the economic returns to attending a racially diverse college". In: *Economic Inquiry* 48.3, pp. 537–557.

Assuncao, Juliano and Bruno Ferman (2015). "Does affirmative action enhance or undercut investment incentives? Evidence from quotas in Brazilian Public Universities". In: *Unpublished Manuscript*. URL: https://www.dropbox.com/s/dnpabbrucu25d0o/Assuncao_and_Ferman_affirmative\%20action.pdf?dl=0.

Bagde, Surendrakumar, Dennis Epple, Lowell Taylor, et al. (2016). "Does affirmative action work? Caste, gender, college quality, and academic success in India". In: *American Economic Review* 106.6, pp. 1495–1521.

Bertrand, Marianne et al. (2014). *Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labor Market Outcomes in Norway*. Working Paper 20256. National Bureau of Economic Research. URL: http://www.nber.org/papers/w20256.

Boisjoly, Johanne et al. (2006). "Empathy or Antipathy? The Impact of Diversity". In: *American Economic Review* 96.5, pp. 1890–1905.

Bowen, William G. and Derek Bok (1998). "The Shape of the River: Long-Term Consequences of Considering Race in College and University Admissions". In:

Card, David and Alan B. Krueger (2005). "Would the elimination of affirmative action affect highly qualified minority applicants? Evidence from California and Texas". In: *ILR Review* 58.3, pp. 416–434.

Carrell, Scott E., Richard L. Fullerton, and James E. West (2009). "Does your cohort matter? Measuring peer effects in college achievement". In: *Journal of Labor Economics* 27.3, pp. 439–464.

Carvalho, Márcia de and Fábio D. Waltenberg (2012). "Ações afirmativas em cursos de graduação no Brasil aumentam a diversidade dos concluintes sem comprometer o desempenho". In: *Sinais Sociais, Rio de Janeiro* 20, pp. 36–77.

Childs, Porsha and Nelly P. Stromquist (2015). "Academic and diversity consequences of affirmative action in Brazil". In: *Compare: A Journal of Comparative and International Education* 45.5, pp. 792–813.

Daniel, Kermit, Dan Black, and Jeffrey Smith (2001). "Racial differences in the effects of college quality and student body diversity on wages". In: pp. 221–231.

Epple, Dennis, Richard Romano, and Holger Sieg (2006). "Admission, tuition, and financial aid policies in the market for higher education". In: *Econometrica* 74.4, pp. 885–928.

Estevan, Fernanda and Louis-Philippe Morin Thomas Gall (2016). *Redistribution without distortion: Evidence from an affirmative action program at a large Brazilian university*. Working Papers, Department of Economics 2016_07. University of São Paulo (FEA-USP). URL: https://EconPapers.repec.org/RePEc:spa:wpaper:2016wpecon7.

Evans, William N., Wallace E. Oates, and Robert M. Schwab (1992). "Measuring Peer Group Effects: A Study of Teenage Behavior". In: *Journal of Political Economy* 100.5, pp. 966–991.

Francis, Andrew M. and Maria Tannuri-Pianto (2012). "Using Brazil's racial continuum to examine the short-term effects of affirmative action in higher education". In: *Journal of Human Resources* 47.3, pp. 754–784.

Guryan, Jonathan (2004). "Desegregation and Black Dropout Rates". In: *American Economic Review* 94.4, pp. 919–943.

Hinrichs, Peter (2012). "The effects of affirmative action bans on college enrollment, educational attainment, and the demographic composition of universities". In: *Review of Economics and Statistics* 94.3, pp. 712–722.

Howell, Jessica S. (2010). "Assessing the impact of eliminating affirmative action in higher education". In: *Journal of Labor Economics* 28.1, pp. 113–166.

INEP (2015). *Higher Education Statistical Synopsis*. Tech. rep. Instituto Nacional de Estudos e Pesquisas Educacionais "Anísio Teixeira", Ministério da Educação, Brasil. URL: http://portal.inep.gov.br/superior-censosuperior-sinopse.

Long, Mark C. (2004). "College applications and the effect of affirmative action". In: *Journal of Econometrics* 121.1, pp. 319–342.

Lu, Fangwen (2014). "Testing peer effects among college students: evidence from an unusual admission policy change in China". In: *Asia Pacific Education Review* 15.2, pp. 257–270.

Lyle, David S. (2009). "The effects of peer group heterogeneity on the production of human capital at West Point". In: *American Economic Journal: Applied Economics* 1.4, pp. 69–84.

Machado, Cecilia and Christiane Szerman (2016). *Centralized Admission and the Student-College Match*. IZA Discussion Papers 10251. Institute for the Study of Labor (IZA). URL: https://ideas.repec.org/p/iza/izadps/dp10251.html.

Mendes Junior, Alvaro Alberto Ferreira, Alberto De Mello e Souza, and Fábio Domingues Waltenberg (2016). "Affirmative Action and Access to Higher Education in Brazil: The Significance of Race and Other Social Factors". In: *Journal of Latin American Studies* 48.2, pp. 301–334.

Rothstein, Jesse and Albert H Yoon (2008). *Affirmative Action in Law School Admissions: What Do Racial Preferences Do?* Tech. rep. National Bureau of Economic Research.

Sacerdote, Bruce (2001). "Peer Effects with Random Assignment: Results for Dartmouth Roommates". In: *The Quarterly journal of economics* 116.2, pp. 681–704.

Sander, Richard H (2004). "A Systemic Analysis of Affirmative Action in American Law Schools". In: *Stanford law review*, pp. 367–483.

Sekhri, Sheetal (2011). "Affirmative Action and Peer Effects: Evidence from Caste based Reservation in General Education Colleges in India". In: *University of Virginia* 23.

Silva, Talita de Moraes Gonçalves (2014). *O impacto das ações Afirmativas no Ensino Superior e o Desempenho dos Alunos*. Tech. rep. FGV EPGE - Dissertações, Mestrado em Economia. URL: http://hdl.handle.net/10438/11924.

Stevenson, Betsey (2010). *Beyond the Classroom: Using Title IX to Measure the Return to High School Sports*. Working Paper 15728. National Bureau of Economic Research. URL: http://www.nber.org/papers/w15728.

Stinebrickner, Ralph and Todd R. Stinebrickner (2006). "What can be learned about peer effects using college roommates? Evidence from new survey data and students from disadvantaged backgrounds". In: *Journal of public Economics* 90.8, pp. 1435–1454.

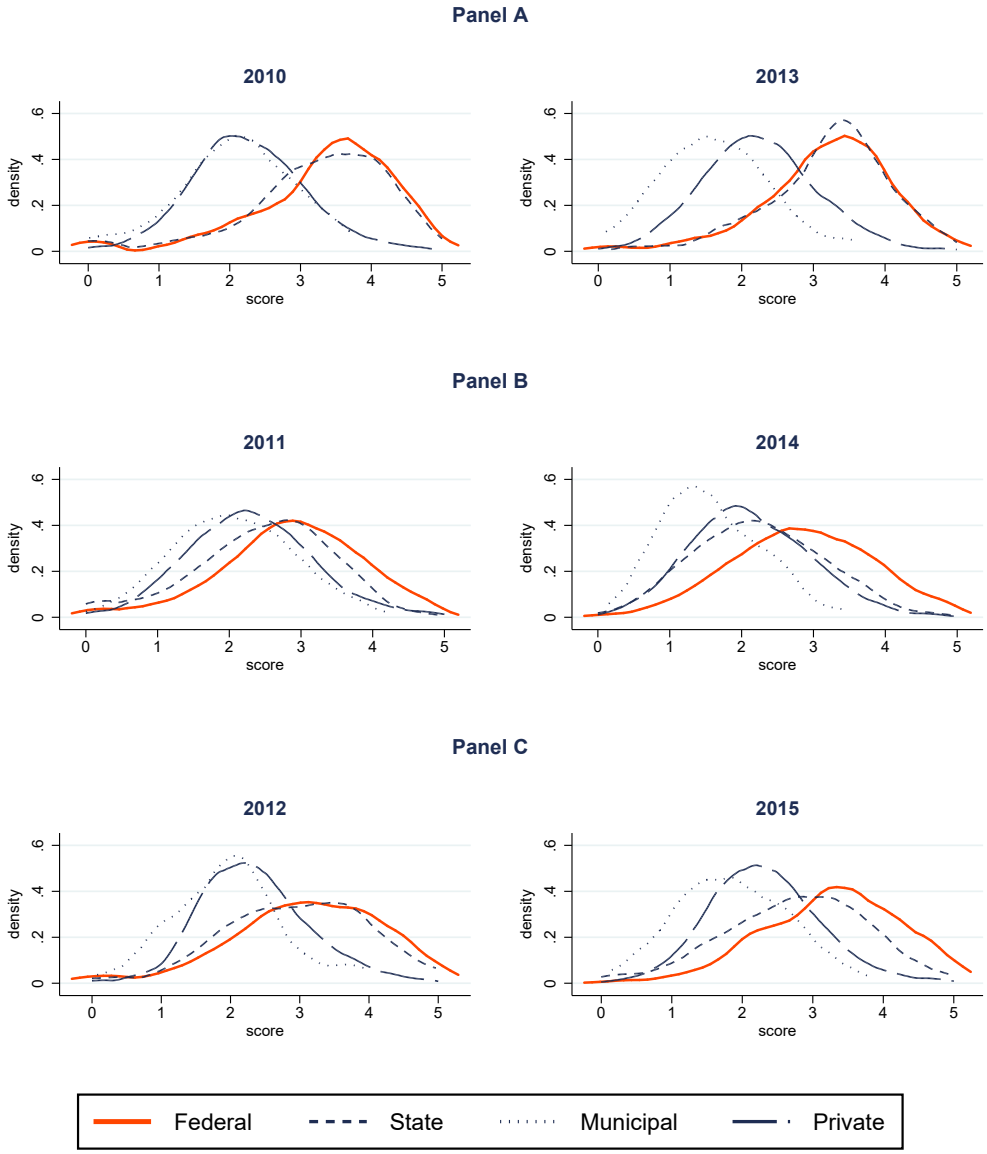
Valente, Rubia R. and Brian J. L. Berry (2016). "Performance of Students Admitted Through Affirmative Action in Brazil". In: *(Forthcoming) Latin American Research Review*.

Winston, Gordon C. (1999). "Subsidies, Hierarchy and Peers: The Awkward Economics of Higher Education". In: *The Journal of Economic Perspectives* 13.1, pp. 13–36.

World Bank (2000). *Brazil: Higher Education Sector Study*. Report. Human Development (LCSHD), Latin America & Caribbean, World Bank. URL: https://openknowledge.worldbank.org/handle/10986/2113.

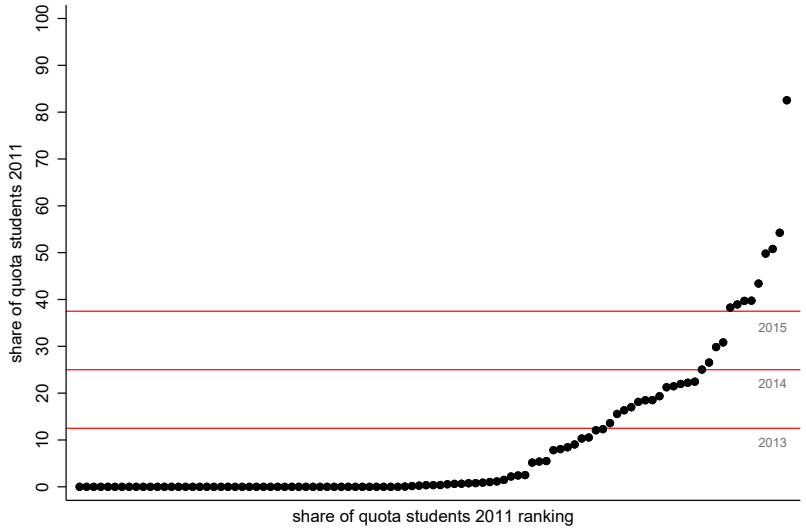
Zimmerman, David J. (2003). "Peer Effects in Academic Outcomes: Evidence from a Natural Experiment". In: *The Review of Economics and statistics* 85.1, pp. 9–23.

Figure 1: Study Program Quality by Institution Type



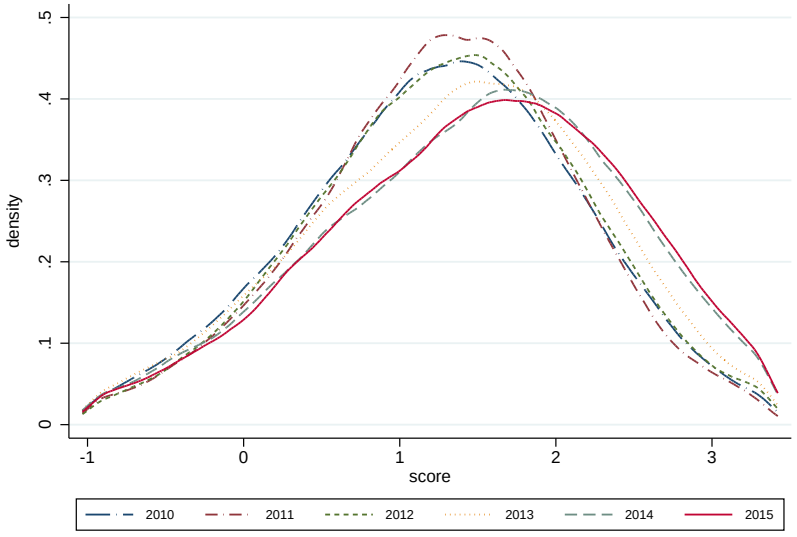
Notes: Figures show kernel density distributions of the program scores by institution type: Federal, State, Municipal and Private. The program of study quality score is a continuous variable in the range between 0 and 5, where 5 is the top score. The assessment is based on infrastructure, teaching-learning resources and faculty, students' performance at the national college exit exam (ENADE), and the difference between expected and observed performance. Figures are organized in different panels following the rotating panel design of ENADE exam, where the same subset of study programs is evaluated every 3 years. Source: Preliminary Course Program Score (CPC) - National Institute for Educational Studies and Research (INEP).

Figure 2: Quota Students Representation in 2011



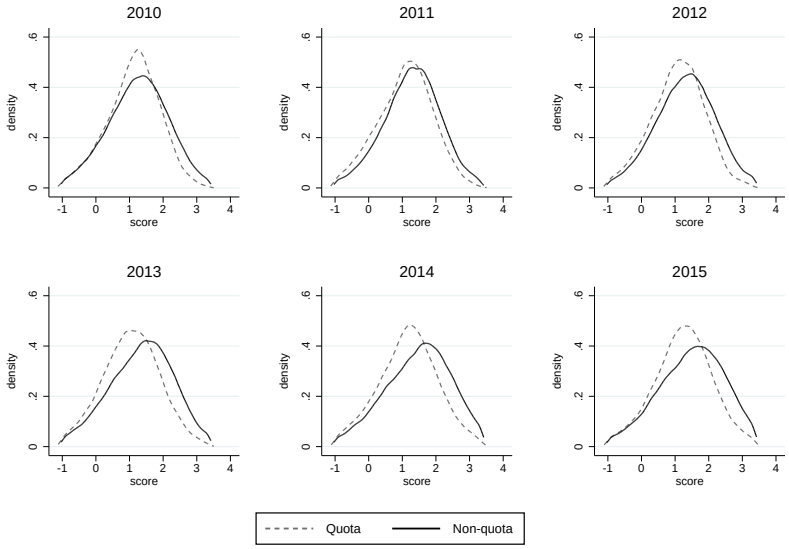
Notes: Dots represent federal universities. Institutions are ranked according to their quota student representation in 2011, and ties are broken randomly. The horizontal lines show the quota minimum threshold of 12.5 percent, 25 percent and 37.5 percent imposed by the *Lei das Cotas* for 2013, 2014 and 2015, respectively. Sample: federal higher education institutions. Source: Higher Education Census 2011.

Figure 3: High School Academic Performance of Non-quota Students



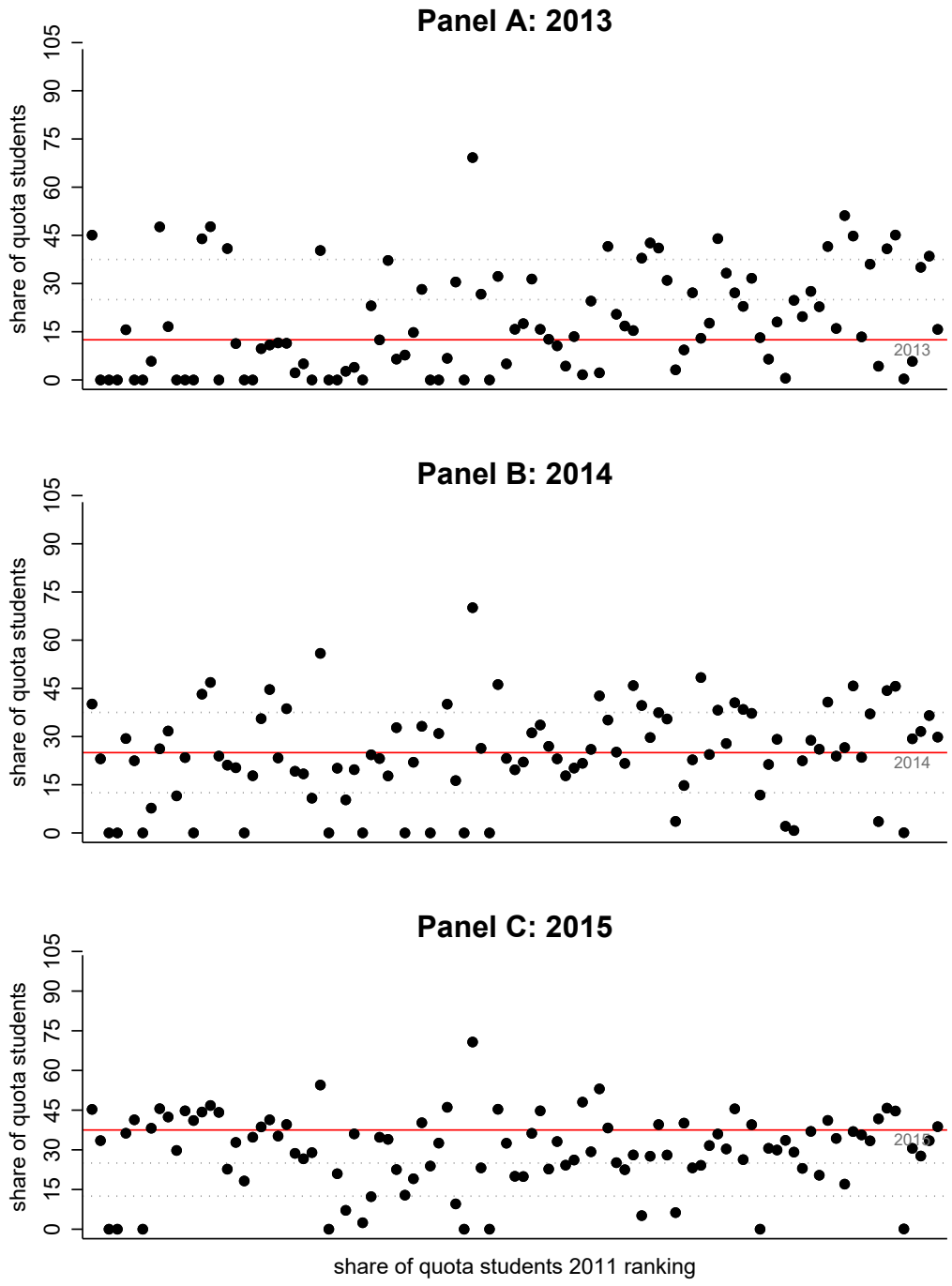
Notes: Each line plots the kernel density of the standardized ENEM scores. The score is the average of the five components of the high school exit exam (Sciences, Humanities, Portuguese, Math and writing essay), standardized to be mean zero unit variance for all test-takers each year. Sample: non-quota students in federal higher education institutions. Source: National High School Exam (ENEM).

Figure 4: High School Academic Performance by Special Admission Status



Notes: Each line plots the kernel density distribution of the ENEM scores for quota and non-quota students. The score is the average of the five components of the high school exit exam (Sciences, Humanities, Portuguese, Math and writing essay), standardized to be mean zero unit variance for all test takers each year. Sample: students in federal higher education institutions. Source: National High School Exam (ENEM).

Figure 5: Quota Students Representation and Minimum Thresholds



Notes: Dots represent federal universities. Institutions are ranked according to their quota student representation in 2011, and ties are broken randomly. The horizontal lines represent the quota minimum thresholds imposed by the *Lei das Cotas* for 2013, 2014 and 2015, respectively. Sample: federal higher education institutions. Source: Higher Education Census.

Table 1: Summary Statistics

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Enrollment Cohort						Diff
	2010	2011	2012	2013	2014	2015	2015-2010
Panel A *. Faculty Characteristics*							
Female	0.418(0.493)	0.425(0.494)	0.433(0.495)	0.432(0.495)	0.432(0.495)	0.436(0.496)	0.018
Age	44.1(10.9)	44.3(10.8)	44.1(10.9)	44.1(10.9)	44.3(10.9)	44.4(10.9)	0.300
White	0.783(0.412)	0.767(0.423)	0.767(0.423)	0.729(0.445)	0.737(0.440)	0.737(0.440)	-0.046
Disabled	0.002(0.045)	0.002(0.043)	0.002(0.042)	0.002(0.043)	0.003(0.052)	0.003(0.053)	0.001
Foreigner	0.021(0.143)	0.022(0.148)	0.023(0.151)	0.022(0.147)	0.028(0.165)	0.026(0.159)	0.005
Specialization	0.049(0.215)	0.040(0.197)	0.046(0.209)	0.047(0.212)	0.039(0.194)	0.043(0.203)	-0.006
Master	0.245(0.43)	0.243(0.429)	0.244(0.429)	0.234(0.424)	0.218(0.413)	0.223(0.416)	-0.022
PhD	0.618(0.486)	0.651(0.477)	0.650(0.477)	0.653(0.476)	0.685(0.464)	0.692(0.462)	0.074
Full time - exclusive	0.812(0.391)	0.825(0.38)	0.808(0.394)	0.809(0.393)	0.816(0.388)	0.819(0.385)	0.007
Full time - not exclusive	0.101(0.302)	0.113(0.316)	0.126(0.332)	0.128(0.334)	0.121(0.326)	0.122(0.327)	0.021
Part time	0.085(0.28)	0.061(0.24)	0.064(0.244)	0.059(0.236)	0.061(0.239)	0.057(0.233)	-0.028
Hour Contract	0.001(0.036)	0.001(0.029)	0.003(0.055)	0.003(0.059)	0.003(0.053)	0.002(0.044)	0.001
Has Research Grant	0.150(0.357)	0.198(0.399)	0.208(0.406)	0.166(0.372)	0.159(0.366)	0.181(0.385)	0.031
Panel B *. Non-quota Students Characteristics*							
Quota Student Share	0.096(0.294)	0.109(0.312)	0.133(0.340)	0.184(0.388)	0.256(0.436)	0.329(0.470)	0.233
Female	0.511(0.500)	0.507(0.500)	0.512(0.500)	0.502(0.500)	0.497(0.500)	0.483(0.500)	-0.028
Age	22.5(6.5)	22.8(6.7)	23(7.0)	23.1(7.1)	23.5(7.4)	23.6(7.5)	1.100
White	0.524(0.499)	0.549(0.498)	0.551(0.497)	0.540(0.498)	0.546(0.498)	0.557(0.497)	0.033
Disabled	0.004(0.062)	0.003(0.054)	0.005(0.069)	0.005(0.073)	0.005(0.072)	0.006(0.074)	0.002
Not married	0.931(0.253)	0.912(0.283)	0.908(0.289)	0.910(0.286)	0.900(0.300)	0.902(0.298)	-0.029
High-educated Father	0.274(0.446)	0.036(0.187)	0.262(0.440)	0.275(0.446)	0.286(0.452)	0.300(0.458)	0.026
High-educated Mother	0.334(0.472)	0.024(0.152)	0.321(0.467)	0.335(0.472)	0.346(0.476)	0.366(0.482)	0.032
Dwelling Owner	0.767(0.423)	0.732(0.443)	0.635(0.481)	0.640(0.480)	0.627(0.484)	0.625(0.484)	-0.142
Urban residence	0.919(0.273)	0.943(0.231)	0.941(0.236)	0.939(0.239)	0.940(0.237)	0.935(0.246)	0.016
Public Primary	0.597(0.490)	0.540(0.498)	0.538(0.499)	0.517(0.500)	0.505(0.500)	0.642(0.479)	0.045
Public Secondary	0.470(0.499)	0.481(0.500)	0.503(0.500)	0.475(0.499)	0.421(0.494)	0.446(0.497)	-0.024
Employed	0.230(0.421)	0.392(0.488)	0.377(0.485)	0.247(0.432)	0.255(0.436)	0.254(0.435)	0.024
Municipality Migration	0.500(0.500)	0.520(0.500)	0.518(0.500)	0.562(0.496)	0.542(0.498)	0.547(0.498)	0.047
State Migration	0.170(0.376)	0.177(0.381)	0.175(0.380)	0.204(0.403)	0.184(0.388)	0.189(0.392)	0.019
Morning shift	0.152(0.359)	0.126(0.332)	0.132(0.339)	0.126(0.331)	0.117(0.322)	0.117(0.322)	-0.035
Enrol first semester	0.629(0.483)	0.634(0.482)	0.667(0.471)	0.659(0.474)	0.658(0.474)	0.660(0.474)	0.031
Program Area							
Education	0.278(0.448)	0.278(0.448)	0.280(0.449)	0.267(0.442)	0.259(0.438)	0.265(0.441)	-0.013
Humanities and Arts	0.039(0.194)	0.042(0.201)	0.044(0.206)	0.044(0.205)	0.042(0.200)	0.041(0.199)	0.002
Soc Sci, Business and Law	0.176(0.381)	0.179(0.383)	0.182(0.385)	0.184(0.387)	0.184(0.388)	0.170(0.376)	-0.006
Sci, Math and Computing	0.128(0.334)	0.129(0.336)	0.134(0.340)	0.133(0.340)	0.134(0.340)	0.133(0.339)	0.005
Eng., Manuf and Construc.	0.172(0.378)	0.175(0.380)	0.170(0.376)	0.180(0.384)	0.184(0.388)	0.198(0.398)	0.026
Agriculture and Veterinary	0.072(0.258)	0.069(0.254)	0.065(0.247)	0.064(0.245)	0.069(0.254)	0.069(0.254)	-0.003
Health and Social Welfare	0.112(0.316)	0.105(0.307)	0.103(0.304)	0.107(0.309)	0.106(0.308)	0.101(0.301)	-0.011
Services	0.021(0.144)	0.022(0.146)	0.022(0.147)	0.022(0.147)	0.022(0.146)	0.023(0.150)	0.002

Notes: Numbers show mean values. Standard deviations are in parentheses. The first 6 columns report cohort averages starting with cohort 2010 in column 1 through cohort 2015 in column 6. The last column reports the difference between the average values for the 2015 cohort and the 2010 cohort. Sample: faculty and fresher non-quota students at federal higher education institutions. Source: Higher Education Census and National High School Exam (ENEM).

Table 2: First Stage Estimates

	[1]	[2]	[3]	[4]	[5]
	Dependent variable: Share of Quota Student				
	Federal				State
Panel A *. Interaction Instrument*					
$QSS_{2011p} \cdot$ I(c=2013)	-0.444***	-0.446***	-0.444***	-0.425***	-0.112*
	(0.110)	(0.111)	(0.113)	(0.123)	-0.065
$QSS_{2011p} \cdot$ I(c=2014)	-0.572***	-0.578***	-0.580***	-0.541***	-0.061
	(0.121)	(0.121)	(0.122)	(0.139)	-0.106
$QSS_{2011p} \cdot$ I(c=2015)	-0.681***	-0.686***	-0.688***	-0.636***	-0.333**
	(0.108)	(0.109)	(0.110)	(0.137)	(0.130)
F -statistic	13.575	13.528	13.383	7.263	2.630
Panel B *. Distance Instrument*					
Distance (QSS_{2011p} -ζ_c)	-0.558***	-0.562***	-0.562***	-0.501***	-0.111
	(0.098)	(0.099)	(0.100)	(0.122)	(0.073)
F -statistic	32.284	32.163	31.797	16.894	2.342
Obs.	645580	601620	599287	599287	210840
Controls					
Program FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Student Characteristics		✓	✓	✓	✓
Program Characteristics			✓	✓	✓
State Linear Trend				✓	✓

Notes: Each column reports estimates for a regression where the dependent variable is the share of quota students. Standard errors are clustered at university level and reported in parentheses. Panel A shows regression results when using the 2011 quota student share interacted with cohort dummies as instrument. Panel B shows regression results when using the distance of the 2011 quota student share to the law minimum thresholds as instrument. ζ_c takes value 12.5 for year 2013, 25 for year 2014 and 37.5 for year 2015. In columns 1 to 4 the estimation sample includes non-quota student from federal colleges. Columns 5 shows a placebo first stage where I estimate (2) and (3) using non-quota students at state-funded universities. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Sample includes all non-quota undergraduate students from federal and state HEIs enrolled in on-site study programs. Year 2012 variables are omitted. Source: Higher Education Census and National High School Exam (ENEM).

Table 3: Quota Students Share and Dropout of Non-quota Students

	[1]	[2]	[3]	[4]	[5]
	Dependent variable: Dropout				
	OLS	Reduced-form		2SLS	
		Instrument Interaction	*Instrument Distance*	*Instrument Pre-share*	*Instrument Distance*
QSS_{cp}	-0.068***			-0.143	-0.083
	(0.024)			(0.305)	(0.288)
$QSS_{2011p} \cdot$ I(c=2013)		-0.006			
		(0.035)			
$QSS_{2011p} \cdot$ I(c=2014)		0.070			
		(0.046)			
$QSS_{2011p} \cdot$ I(c=2015)		0.122***			
		(0.041)			
Distance (QSS_{2011p} -ζ_c)			0.042		
			(0.031)		
Obs.	718,489	599287	599287	599287	599287
Avg. dropout	14.96	14.96	14.96	14.96	14.96
Controls					
Program FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Student Characteristics	✓	✓	✓	✓	✓
Program Characteristics	✓	✓	✓	✓	✓
State Linear Trend	✓	✓	✓	✓	✓

Notes: Each column reports estimates for a regression where the dependent variable is dropout. The dropout variable takes value 1 if the student enrollment status, measured in December each year, is either on-leave or withdrawal, and 0 otherwise. Standard errors are clustered at university level and reported in parentheses. Column 1 shows OLS regression results. Columns 2 and 3 show the reduced-form estimates using the 2011 quota student share interacted with cohort dummies and the distance as instruments, respectively. Finally, columns 4 and 5 present IV estimations. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Sample includes fresher non-quota students at federal universities. Source: Higher Education Census and National High School Exam (ENEM).

Table 4: Balance by Share of Quota Students in 2011

	[1]	[2]	[3]
	(QSS_{2011} >=12.5%)	(QSS_{2011} <12.5%)	*p* -value
Panel A. *Institution Characteristics*			
State Capital City	57.7	64.0	0.577
Central-West region	3.8	12.0	0.132
Northeast region	34.6	22.7	0.263
North region	3.8	20.0	0.009
Southeast region	30.8	32.0	0.908
South region	26.9	13.3	0.162
IFECT	26.9	44.0	0.108
Avg. size	4128.0	2325.9	0.006
Avg. degree workload	3173.5	3281.4	0.222
Panel B. *Faculty Demographics*			
Female	44.0	42.0	0.058
Age	45.3	43.3	0.016
White	78.3	77.7	0.915
Master or PhD	88.0	85.6	0.298
Research grant	21.2	21.8	0.939
Full time contract	79.6	78.8	0.777
Panel C. *Non-quota Students Demographics and College Characteristics*			
Female	51.9	50.2	0.145
Age	22.8	22.8	0.878
White	60.5	52.4	0.184
High-educated Father	3.4	3.8	0.287
High-educated Mother	2.3	2.4	0.442
Dwelling owned by Family	75.1	72.4	0.009
Urban residence	95.0	94.1	0.223
Public Primary	41.8	58.9	0.000
Public Secondary	29.8	56.5	0.000
Employed	33.2	41.5	0.002
Municipality Migration	51.2	52.4	0.861
State Migration	15.1	18.8	0.275
Morning shift	14.3	11.9	0.571
Enrolled in first semester	64.4	63.0	0.773
ENEM Score	1.3	1.2	0.202
Dropout	11.3	12.3	0.602
Observations			
Institutions	26	75	
Faculty	31381	47144	
Students	77854	170186	

Notes: Columns 1 and 2 contain mean values for less and most affected HEIs, depending on their share of quota students in 2011. Column 3 contains the *p*-values of a separate regression in which the dependent variable is a pre-law characteristic, as specified on the left-hand side of the table, and the running variable is a dummy variable taking value 1 if the pre-existing share was below 12.5 percent and 0 if it was above. Standard errors are clustered at university level. There are two variables that present a considerable amount of missing values and should interpreted with caution in the student demographics section: race (59%) and income at municipality of birth (38%). The dropout variable takes value 1 if the student enrollment status, measured in December 2011, is either on-leave or withdrawal, and 0 otherwise. The last three rows of the table show the number of institutions, faculty and first-year students in each group. Source: 2011 Higher Education Census.

Table 5: Testing for Parallel Trends of Non-quota Students Dropout

	[1]	[2]	[3]	[4]	[5]	[6]
	Federal		Federal and State			
Panel A. *Linear Trend*						
(QSS_{2011} <12.5)·Time trend	0.0146	0.0101				
	(0.0254)	(0.0121)				
Federal·Time trend			-0.0019	0.0011		
			(0.0107)	(0.0096)		
(QSS_{2011} <12.5)·Federal·Time trend					0.0098	0.0071
					(0.0270)	(0.0130)
Panel B. *Cohort Dummies*						
(QSS_{2011} <12.5)·𝕀(c=2011)	-0.0313	-0.0215				
	(0.0494)	(0.0368)				
(QSS_{2011} <12.5)·𝕀(c=2012)	-0.002	0.0069				
	(0.0505)	(0.0372)				
Federal·𝕀(c=2011)			0.0112	-0.0184		
			(0.0081)	(0.0178)		
Federal·𝕀(c=2012)			0.0259***	0.0012		
			(0.0098)	(0.0194)		
(QSS_{2011} <12.5)·Federal·𝕀(c=2011)					0.0454	0.0322
					(0.0516)	(0.0351)
(QSS_{2011} <12.5)·Federal·𝕀(c=2012)					0.0202	0.0168
					(0.0543)	(0.0364)
HEI Fixed Effect	No	✓	No	✓	No	✓
F -statistics	0.170	0.363	1.207	1.874	0.986	0.615
p -value	0.844	0.697	0.301	0.156	0.375	0.542
Observations	555246	555246	796717	796717	744366	744366

Notes: Each column reports estimates for a regression where the dependent variable is dropout. The dropout variable takes value 1 if the student enrollment status, measured in December each year, is either on-leave or withdrawal, and 0 otherwise. Standard errors are clustered at university level and reported in parentheses. In Panel A, the outcome is allowed to vary according to a linear time (cohort) trend that differs in treatment and control group. In Panel B, outcome in treatment and control is allow to vary freely for each cohort of students. $\mathbb{1}(c = 201x)$ are cohort (years) dummy variables. Federal is a dummy variable that takes value 1 if the institution is federally-funded and 0 if it is state-funded. *F*-statistics test whether all the double interaction terms (columns 1 to 4) and triple interaction terms (columns 5 and 6) of Panel B are jointly zero. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Source: Higher Education Census.

Table 6: Triple Difference Estimates of Quota Students on Peer's Dropout

	[1]	[2]	[3]	[4]
	Period 2010-2015		Period 2012-2015	
$(QSS_{2011} < 12.5) \cdot Federal \cdot Post$	-0.0032		-0.0018	
	(0.0257)		(0.0212)	
$(QSS_{2011} < 12.5) \cdot Federal \cdot \mathbb{1}(c=2011)$		0.0454		
		(0.0516)		
$(QSS_{2011} < 12.5) \cdot Federal \cdot \mathbb{1}(c=2012)$		0.0202		
		(0.0543)		
$(QSS_{2011} < 12.5) \cdot Federal \cdot \mathbb{1}(c=2013)$		0.0412		0.0209
		(0.0594)		(0.0211)
$(QSS_{2011} < 12.5) \cdot Federal \cdot \mathbb{1}(c=2014)$		0.0029		-0.0173
		(0.0550)		(0.0268)
$(QSS_{2011} < 12.5) \cdot Federal \cdot \mathbb{1}(c=2015)$		0.0066		-0.0136
		(0.0611)		(0.0300)
Observations	1373840	1373840	881433	881433

Notes: Each column reports estimates for a regression where the dependent variable is dropout. The dropout variable takes value 1 if the student enrollment status, measured in December each year, is either on-leave or withdrawal, and 0 otherwise. Standard errors are clustered at university level and reported in parentheses. Estimation sample in columns 1 and 2 covers cohorts 2010 to 2015. Estimation sample in columns 3 and 4 covers cohorts 2012 to 2015. $\mathbb{1}(c = 201x)$ are cohort (years) dummy variables. Federal is a dummy variable that takes value 1 if the institution is federally-funded and 0 if it is state-funded. Individual and double interaction variables were included but not reported. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Sample: federal and state institutions. Source: Higher Education Census.

Table 7: Reduced-form Estimates of the Effect of Quota Students on Non-quota Students' Characteristics

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Female	Age	White	Disabled	High-educated	High-educated	Public Primary	Public Secondary	Migrant State	Migrant Municip.
Panel A *. Interaction Instrument*										
$QSS_{2011p} \cdot 1(c=2013)$	0.000	0.002	0.000	0.000	-0.001**	-0.001**	0.001**	-0.000	0.001	0.001
	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)
$QSS_{2011p} \cdot 1(c=2014)$	-0.000	-0.001	-0.000	0.000	-0.000	-0.000	0.001	-0.001	0.001**	0.001
	(0.000)	(0.004)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)
$QSS_{2011p} \cdot 1(c=2015)$	-0.000	-0.002	-0.000	0.000	-0.000	-0.000	0.002**	0.001	0.001**	0.001
	(0.000)	(0.004)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)
Panel B *. Distance Instrument*										
Distance (QSS_{2011p} -ζ_c)	-0.000	0.001	-0.000	0.000	-0.000	-0.000	0.001*	-0.000	0.001*	0.001
	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)
Mean	0.498	22.25	0.544	0.00490	0.279	0.340	0.536	0.456	0.186	0.541
Obs.	643016	643016	632285	643016	612785	633976	569575	642838	408807	408807
Controls										
Program FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Student Characteristics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Program Characteristics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Linear Trend	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Each column reports estimates of a regression where the dependent variable is a non-quota student characteristic, as defined in the head of each column. Standard errors are clustered at university level and reported in parentheses. Panel A shows regression results when using the 2011 quota student share interacted with cohort dummies as instrument. Panel B shows regression results when using the distance of the 2011 quota student share to the law minimum thresholds as instrument. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Sample includes fresher non-quota students at federal universities. Source: Higher Education Census and National High School Exam (ENEM).

Table 7 (Cont.): Reduced-form Estimates of the Effect of Quota Students on Non-quota Students' Characteristics

	[11]	[12]	[13]	[14]	[15]	[16]
	ENEM Score					
	Sciences	Humanities	Portuguese	Math	Essay	Total
Panel A *. Interaction Instrument*						
$QSS_{2011p} \cdot$ 1(c=2013)	0.001	0.001	0.001	0.001	0.002*	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$QSS_{2011p} \cdot$ 1(c=2014)	0.003**	0.002*	0.002*	0.002*	0.005***	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
$QSS_{2011p} \cdot$ 1(c=2015)	0.002	0.002	0.002	0.003**	0.005***	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Panel B *. Distance Instrument*						
Distance ($QSS_{2011p} - \zeta_c$)	0.002	0.001	0.001	0.002*	0.004***	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mean	1.223	1.147	1.038	1.155	1.058	1.407
Obs.	631278	631278	630212	630212	628515	631459
Controls						
Degree FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Student Characteristics	✓	✓	✓	✓	✓	✓
Degree Characteristics	✓	✓	✓	✓	✓	✓
State Linear Trend	✓	✓	✓	✓	✓	✓

Notes: Each column reports estimates of a regression where the dependent variable is a non-quota student characteristic, as defined in the head of each column. Standard errors are clustered at university level and reported in parentheses. Panel A shows regression results when using the 2011 quota student share interacted with cohort dummies as instrument. Panel B shows regression results when using the distance of the 2011 quota student share to the law minimum thresholds as instrument. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Sample includes fresher non-quota students at federal universities. Source: Higher Education Census and National High School Exam (ENEM).

Table 8: Relation between Quota Students Share and Dropout of High-Achievers Non-quota Students

	[1]	[2]	[3]	[4]	[5]
	Dependent variable: Dropout				
	OLS	Reduced-Form		2SLS	
		Instrument Pre-share	*Instrument Distance*	*Instrument Pre-share*	*Instrument Distance*
QSS_{cp}	-0.087***			-0.218*	-0.147
	(0.029)			(0.112)	(0.103)
$QSS_{2011p} \cdot$ I(c=2013)		0.011			
		(0.043)			
$QSS_{2011p} \cdot$ I(c=2014)		0.119**			
		(0.059)			
$QSS_{2011p} \cdot$ I(c=2015)		0.172***			
		(0.056)			
Distance (QSS_{2011p} -ζ_c)			0.074*		
			(0.043)		
Obs.	355,915	297105	297105	297105	297105
Avg. dropout	18.43	18.43	18.43	18.43	18.43
Controls					
Program FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Student Characteristics	✓	✓	✓	✓	✓
Program Characteristics	✓	✓	✓	✓	✓
State Linear Trend	✓	✓	✓	✓	✓

Notes: Each column reports estimates for a regression where the dependent variable is dropout. The dropout variable takes value 1 if the student enrollment status, measured in December each year, is either on-leave or withdrawal, and 0 otherwise. Standard errors are clustered at university level and reported in parentheses. Column 1 shows OLS regression results. Columns 2 and 3 show the reduced-form estimates using the 2011 quota student share interacted with cohort dummies and the distance as instruments, respectively. Finally, columns 4 and 5 present IV estimations. Regression sample is identical to the one use for the baseline results presented in Table 3, but keeping only high-achievers non-quota students. High-achievers include students with an ENEM score above the median within their cohort-cell. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Sample includes fresher high-achievers non-quota students at federal universities. Source: Higher Education Census and National High School Exam (ENEM).

Table 9: Reduced-form Estimates of the Effect of Quota Students on Faculty Characteristics

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Female	Age	White	Foreigner	Master Degree	Phd Degree	Full Time Contract	Research grant
Panel A *. Interaction Instrument*								
$QSS_{2011p} \cdot 1(c=2013)$	-0.014	1.765**	0.012	0.003	-0.001	-0.042	-0.061*	0.388
	(0.027)	(0.733)	(0.136)	(0.009)	(0.025)	(0.037)	(0.034)	(0.241)
$QSS_{2011p} \cdot 1(c=2014)$	-0.026	2.486***	0.103	-0.007	-0.001	0.005	-0.041	0.396
	(0.024)	(0.821)	(0.102)	(0.009)	(0.032)	(0.035)	(0.043)	(0.371)
$QSS_{2011p} \cdot 1(c=2015)$	-0.044	3.661***	0.092	0.020	0.000	0.037	-0.007	-0.484*
	(0.028)	(1.191)	(0.087)	(0.017)	(0.036)	(0.049)	(0.057)	(0.257)
Panel B *. Distance Instrument*								
Distance ($QSS_{2011p} - \zeta_c$)	-0.024	2.420***	0.055	0.003	-0.001	-0.008	-0.042	0.055
	(0.022)	(0.819)	(0.119)	(0.010)	(0.024)	(0.028)	(0.034)	(0.228)
Mean	0.433	44.17	0.740	0.0250	0.230	0.670	0.813	0.178
Obs.	24679	24679	10240	24679	24679	24679	24679	10373
Controls								
Program FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Student Characteristics	✓	✓	✓	✓	✓	✓	✓	✓
Program Characteristics	✓	✓	✓	✓	✓	✓	✓	✓
State Linear Trend	✓	✓	✓	✓	✓	✓	✓	✓

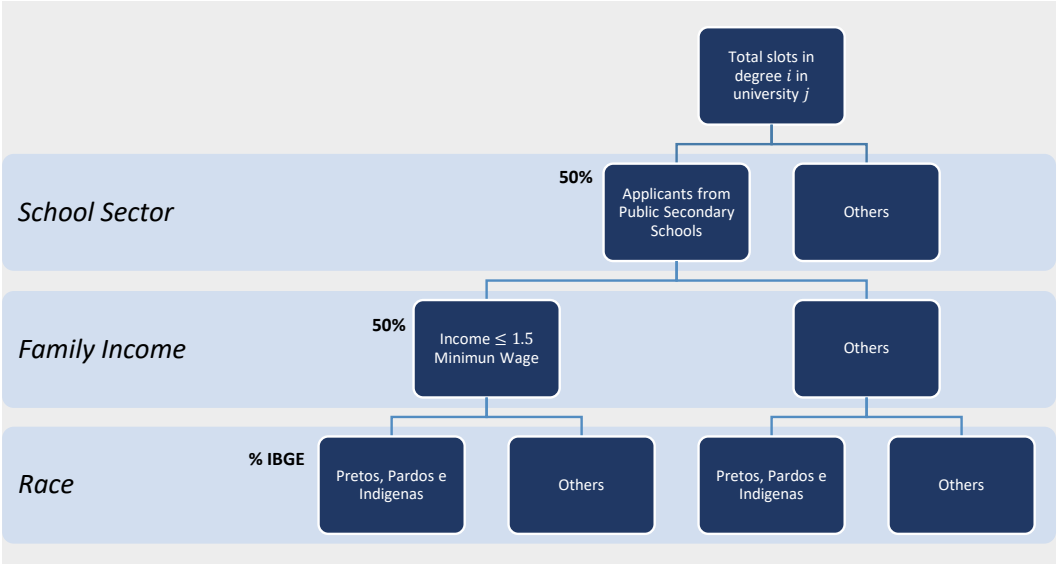
Notes: Each column reports estimates of a regression where the dependent variable is a faculty characteristic, as defined in the head of each column. Standard errors are clustered at university level and reported in parentheses. Panel A shows regression results when using the 2011 quota student share interacted with cohort dummies as instrument. Panel B shows regression results when using the distance of the 2011 quota student share to the law minimum thresholds as instrument. *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level. Sample includes faculty at federal universities. Source: Higher Education Census and National High School Exam (ENEM).

Appendices

A *Lei das Cotas*

In April 2012, the Supreme Court in Brazil declared constitutional the adoption of racial quotas as an admission criterion. The *Lei das Cotas* was subsequently approved in August of the same year. The law mandated to all federally-funded higher education institutions the implementation of a 50 percent quota in their admission process by 2016. The law establishes that specially admitted students should be selected according to multiple disadvantage criteria, as shown in Figure A1. In each program of study offered, half of the slots are reserved for graduate students from public secondary schools. Among these reserved seats, half should be allocated to students whose family income is not higher than one and a half monthly minimum wage. Last, among those coming from public schools and belonging to low income families, the slots should be distributed by race, according to the share of preto, pardo and indigenous population living in the same state where the institution is located—in accordance with the figures reported by the Demographic Census of the Brazilian Institute of Geography and Statistics (IBGE).

Figure A1: Distribution of the Quota across Eligibility Criteria



Notes: Law 12.711, Decree No. 7.824/2012, Ministry of Education (MEC).

B Matched Data

Table B reports the size of students' cohort from 2010 to 2015 and the matching rates per year. Panel A reports results for all students in federal (columns 1 to 4) and state (columns 5 to 8) higher education institutions. Panel B, reports results for the same HEIs dimensions but considering only non-quota students.

Table B1: Students Cohort Size and Matching Rates

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Student Cohort	Federal				State			
	Census		Matched with ENEM	Matching Rate	Census		Matched with ENEM	Matching Rate
	Students	Missing ID			Students	Missing ID		
Panel A. *Non-quota Students*								
2010	243239	877	178372	73.3%	116392	4237	63618	54.7%
2011	251057	143	200253	79.8%	122445	19	71222	58.2%
2012	260207	157	208623	80.2%	124829	8	74629	59.8%
2013	243690	132	200366	82.2%	110685	1	75951	68.6%
2014	232608	59	191547	82.3%	108772	4	75370	69.3%
2015	217427	38	180427	83.0%	109753	5	80096	73.0%
Panel B. *All Students*								
2010	269016	907	200208	74.4%	134932	4298	75682	56.1%
2011	281772	143	226548	80.4%	139111	19	82376	59.2%
2012	300210	160	243716	81.2%	144932	8	87752	60.5%
2013	298946	134	251498	84.1%	139744	2	94783	67.8%
2014	313195	59	267820	85.5%	144063	5	99810	69.3%
2015	323914	38	282406	87.2%	147480	6	105661	71.6%

Notes: Columns 1 and 5 reports the number of first year students as registered in the Higher Education Census. Columns 2 and 6 reports the number of students with missing identification number. Columns 3 and 7 reports the numbers of students for which it was possible to track their ENEM score. Finally, columns 4 and 8 reports the matching rate. The results are divided into two panels: Panel A shows results for non-quota students in federal and state institutions while Panel B considers the whole student population enrolled in on-site study programs. Source: Higher Education Census (2010-2015) and ENEM (2009-2014).

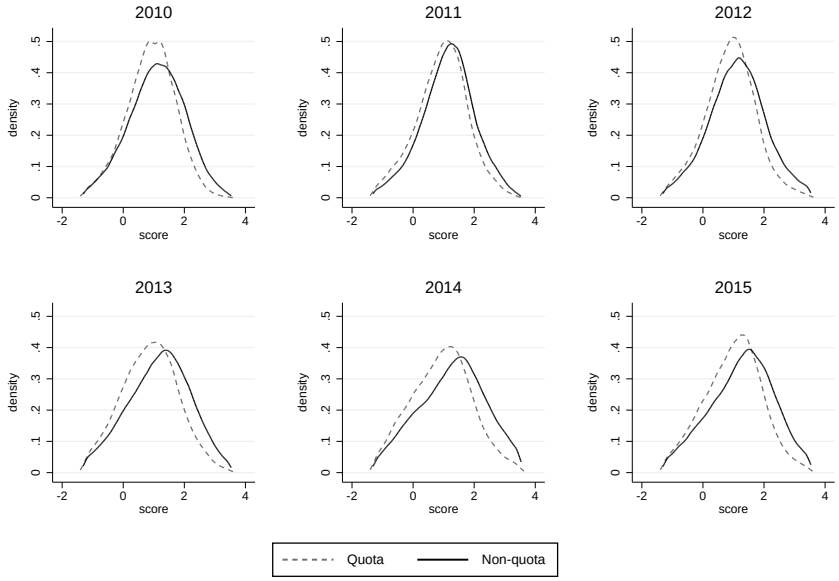
C Complementary Summary Statistics

Table C1: Summary Statistics - Students and Faculty at State Universities

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Enrollment Cohort						Diff
	2010	2011	2012	2013	2014	2015	2015-2010
Panel A *. Faculty Characteristics*							
Female	0.468(0.499)	0.472(0.499)	0.467(0.499)	0.462(0.499)	0.460(0.498)	0.469(0.499)	0.001
Age	45.9(10.7)	45.6(10.8)	45.7(10.9)	45.8(10.9)	45.9(10.9)	45.8(10.9)	-0.100
White	0.802(0.399)	0.780(0.414)	0.752(0.432)	0.732(0.443)	0.760(0.427)	0.739(0.439)	-0.063
Disabled	0.001(0.036)	0.002(0.043)	0.003(0.053)	0.002(0.050)	0.003(0.054)	0.004(0.066)	0.003
Foreigner	0.021(0.143)	0.024(0.152)	0.024(0.154)	0.022(0.147)	0.025(0.155)	0.024(0.154)	0.003
Specialization	0.168(0.374)	0.157(0.364)	0.151(0.358)	0.134(0.341)	0.125(0.330)	0.120(0.325)	-0.048
Master	0.272(0.445)	0.287(0.452)	0.288(0.453)	0.284(0.451)	0.274(0.446)	0.286(0.452)	0.014
PhD	0.488(0.500)	0.488(0.500)	0.504(0.500)	0.541(0.498)	0.566(0.496)	0.567(0.496)	0.079
Full time - exclusive	0.459(0.498)	0.466(0.499)	0.474(0.499)	0.540(0.498)	0.549(0.498)	0.542(0.498)	0.083
Full time - not exclusive	0.295(0.456)	0.273(0.445)	0.281(0.449)	0.251(0.434)	0.238(0.426)	0.250(0.433)	-0.045
Part time	0.157(0.364)	0.158(0.365)	0.162(0.369)	0.142(0.349)	0.147(0.354)	0.150(0.357)	-0.007
Hour Contract	0.090(0.286)	0.103(0.304)	0.082(0.275)	0.067(0.249)	0.066(0.249)	0.058(0.234)	-0.032
Has Research Grant	0.237(0.425)	0.164(0.370)	0.128(0.334)	0.186(0.389)	0.157(0.364)	0.069(0.254)	-0.168
Panel B *. Non-quota Students Characteristics*							
Quota Student Share	0.138(0.345)	0.120(0.325)	0.138(0.345)	0.204(0.403)	0.245(0.43)	0.249(0.432)	0.111
Female	0.539(0.498)	0.529(0.499)	0.540(0.498)	0.532(0.499)	0.527(0.499)	0.527(0.499)	-0.012
Age	23.6(7.2)	23.3(7.1)	23.6(7.3)	22.7(6.8)	23.1(7.2)	23.1(7.2)	-0.500
White	0.605(0.489)	0.594(0.491)	0.574(0.495)	0.569(0.495)	0.562(0.496)	0.587(0.492)	-0.018
Disabled	0.005(0.073)	0.002(0.044)	0.003(0.052)	0.003(0.056)	0.003(0.056)	0.003(0.058)	-0.002
Not married	0.949(0.219)	0.941(0.235)	0.939(0.239)	0.938(0.241)	0.933(0.249)	0.929(0.256)	-0.020
High-educated Father	0.266(0.442)	0.043(0.203)	0.254(0.435)	0.265(0.441)	0.271(0.445)	0.260(0.438)	-0.006
High-educated Mother	0.314(0.464)	0.028(0.164)	0.301(0.459)	0.320(0.467)	0.331(0.471)	0.320(0.467)	0.006
Dwelling Owner	0.806(0.396)	0.772(0.419)	0.687(0.464)	0.682(0.466)	0.678(0.467)	0.668(0.471)	-0.138
Urban residence	0.893(0.309)	0.927(0.260)	0.924(0.265)	0.921(0.270)	0.923(0.267)	0.913(0.281)	0.020
Public Primary	0.631(0.482)	0.579(0.494)	0.584(0.493)	0.560(0.496)	0.545(0.498)	0.741(0.438)	0.110
Public Secondary	0.680(0.466)	0.578(0.494)	0.593(0.491)	0.558(0.497)	0.510(0.500)	0.477(0.499)	-0.203
Employed	0.216(0.412)	0.345(0.475)	0.314(0.464)	0.209(0.407)	0.211(0.408)	0.220(0.414)	0.004
Municipality Migration	0.573(0.495)	0.556(0.497)	0.563(0.496)	0.563(0.496)	0.543(0.498)	0.563(0.496)	-0.010
State Migration	0.116(0.320)	0.119(0.324)	0.139(0.346)	0.127(0.333)	0.124(0.329)	0.137(0.344)	0.021
Morning shift	0.236(0.425)	0.248(0.432)	0.245(0.430)	0.220(0.414)	0.229(0.420)	0.201(0.400)	-0.035
Enrol first semester	0.765(0.424)	0.752(0.432)	0.743(0.437)	0.780(0.414)	0.716(0.451)	0.738(0.440)	-0.027
Program Area							
Education	0.424(0.494)	0.385(0.487)	0.388(0.487)	0.385(0.487)	0.359(0.480)	0.381(0.486)	-0.043
Humanities and Arts	0.037(0.189)	0.039(0.195)	0.036(0.186)	0.030(0.171)	0.026(0.158)	0.024(0.152)	-0.013
Soc Sci, Business and Law	0.180(0.384)	0.193(0.395)	0.213(0.410)	0.193(0.394)	0.205(0.404)	0.206(0.404)	0.026
Sci, Math and Computing	0.096(0.295)	0.104(0.305)	0.099(0.299)	0.111(0.314)	0.106(0.308)	0.091(0.288)	-0.005
Eng., Manuf and Construc.	0.113(0.317)	0.131(0.337)	0.120(0.325)	0.125(0.331)	0.140(0.347)	0.137(0.344)	0.024
Agriculture and Veterinary	0.053(0.224)	0.048(0.214)	0.048(0.213)	0.052(0.222)	0.049(0.217)	0.047(0.211)	-0.006
Health and Social Welfare	0.084(0.277)	0.082(0.275)	0.081(0.272)	0.089(0.285)	0.096(0.295)	0.094(0.292)	0.010
Services	0.014(0.116)	0.017(0.130)	0.015(0.123)	0.015(0.121)	0.018(0.133)	0.021(0.143)	0.007

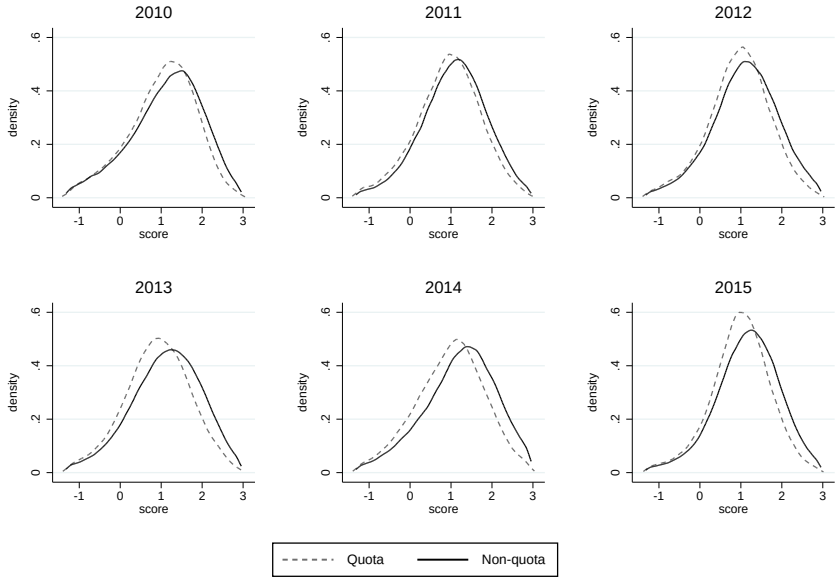
Notes: Numbers show mean values. Standard deviations are in parentheses. The first 6 columns report cohort averages starting with cohort 2010 in column 1 through cohort 2015 in column 6. The last column reports the difference between the average values for the 2015 cohort and the 2010 cohort. Sample: state higher education institutions. Source: Higher Education Census and National High School Exam (ENEM).

Figure C1: Sciences High School Score by Special Admission Status



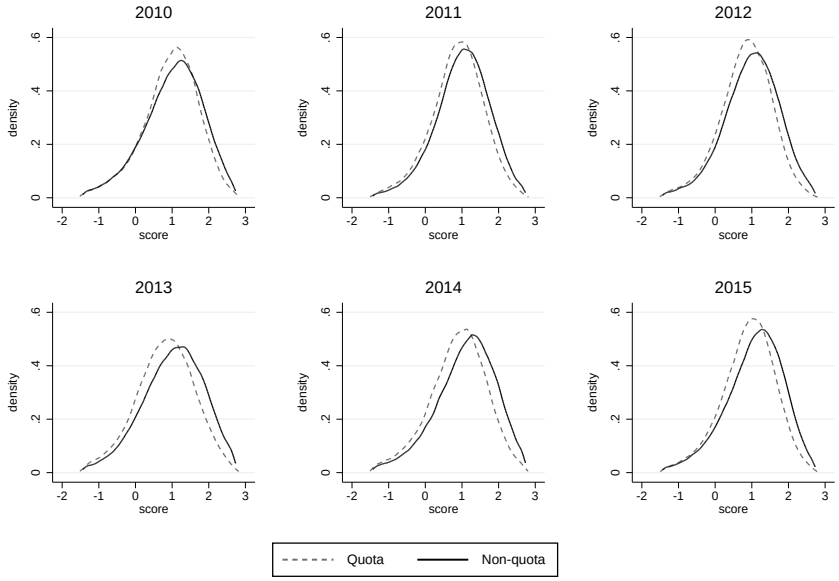
Notes: Each line plots the kernel density distribution of the Natural Science ENEM scores for quota and non-quota students. The score is standardized to be mean zero unit variance for all test takers each year. Sample: students in federal universities. Source: National High School Exam (ENEM).

Figure C2: Humanities High School Score by Special Admission Status



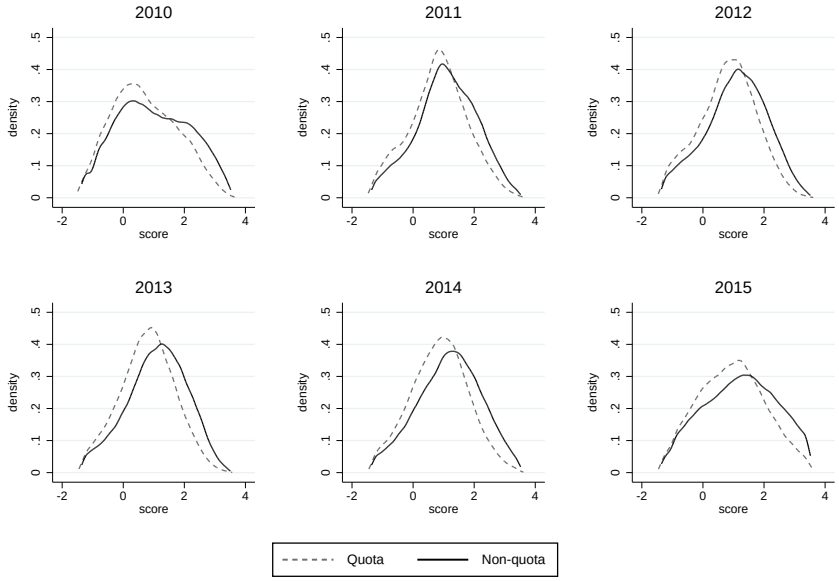
Notes: Each line plots the kernel density distribution of the Human Science ENEM scores for quota and non-quota students. The score is standardized to be mean zero unit variance for all test takers each year. Sample: students in federal universities. Source: National High School Exam (ENEM).

Figure C3: Portuguese High School Score by Special Admission Status



Notes: Each line plots the kernel density distribution of the Portuguese ENEM scores for quota and non-quota students. The score is standardized to be mean zero unit variance for all test takers each year. Sample: students in federal universities. Source: National High School Exam (ENEM).

Figure C4: Math High School Score by Special Admission Status



Notes: Each line plots the kernel density distribution of the Math ENEM scores for quota and non-quota students. The score is standardized to be mean zero unit variance for all test takers each year. Sample: students in federal universities. Source: National High School Exam (ENEM).

School of Economics and Finance

Queen Mary
University of London

This working paper has been produced by
the School of Economics and Finance at
Queen Mary University of London

School of Economics and Finance
Queen Mary University of London
Mile End Road
London E1 4NS
Tel: +44 (0)20 7882 7356
Fax: +44 (0)20 8983 3580
Web: www.econ.qmul.ac.uk/research/workingpapers/