University Quotas and Peers' Achievement

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In 2012, the Brazilian government passed a law that mandated that all federal higher education institutions 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. The identification rests on the use of pre-law crosswise variation in specially admitted student representation as an instrument for exogenous changes in the student body composition. The affirmative action policy causes an increase in the variance of academic ability within university programs. However, I find no evidence that the increased enrolment of targeted students affects the dropout of non-quota students.*

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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 arenas. 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 enrol in college.

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As is common in situations of scarce resource reallocation, affirmative action (AA) policies are not uncontroversial. Vigorous debates have been held on this topic in countries where these policies are an established practice, such as India, or where they are banned by court rulings, such as the US. Contributing to the debate on preferential admission treatment, there has been a proliferation of studies discussing policy effectiveness, concerning both the extensive and the intensive margin. This involves, 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 the intended beneficiaries are well suited academically (the so-called "mismatch" hypothesis). It may be the case that these policies actually harm the targeted students by placing them in challenging environments, for which they are poorly prepared.[1]

This paper contrasts the existing literature on AA programs by focusing on a rather neglected dimension. In particular, I study how the inflow of specially admitted students (hereafter, quota students) 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 enroled in federal universities, with a large dispersion across institutions, as shown in Section I.B.[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, as in the settings where most of the research on AA policies has been conducted. This fact allows us 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 universities are

[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 policies on minority college enrolment 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 this topic. 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.

disseminated across all regions of 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. Finally, the data allow us to identify which students access education through the existence of quotas, while this is usually inferred in other settings. For example, studies on the US use ethnicity to categorize quota students.[3]

To estimate the effect of the inflow of quota students, 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 variable (IV) strategy is motivated by the fact that the constraints faced by each university regarding the admission of quota students depends 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 a non-existent AA program or a small number of quota students enroled.

There are a number of challenges related to the exclusion restrictions needed to interpret two-stage least squares (2SLS) estimates. First, 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 it more difficult to find an effect of the reform and simultaneously 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 were less likely. Similarly, the causal interpretation of the results is potentially muddled by two factors: (i) a spurious correlation between the quota student 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 student population. I provide suggestive evidence against the first limitation and rule out composition effects by restricting the analysis to high-achiever 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

[3]India provides a similar setting to the one described for Brazil in terms of the 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.

probability of non-quota students. Furthermore, for the group of high-achiever non-quota students, the results are negative, meaning that, if anything, they drop out less as the share of quota students in the same study program increases. The results are in line with those of Guryan, 2004, who found no dropout effect of white students after the implementation of high school desegregation plans in the US during the 1970s. One possible interpretation of these findings, 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 the earnings of non-intended beneficiaries can be found in 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 a 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, the empirical research evaluating the effect of affirmative action is mostly concerned with application incentives (Carvalho and Waltenberg, 2012; Estevan, Gall, and Morin, 2016), reduction in admission gaps (Mendes Junior, Souza, and Waltenberg, 2016) and the academic performance of beneficiaries (Childs and Stromquist, 2015; Francis and Tannuri-Pianto, 2012). Less is known about the impact of a more diverse college environment on non-quota students, except for the work of Silva, 2014, who reports negative correlations between being exposed to quota students and the college performance of non-quota students for a period prior to *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 literature on peer effects 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 to admit (Sekhri, 2011). This implies that the student body composition may be correlated with unobserved individual traits or institutional-level components (Arcidiacono and Vigdor, 2010). To identify causal effects, scholars have exploited the random assignment of students to classrooms in military academies (Carrell, Fullerton, and West, 2009; Lyle, 2009) or to college dormitories (Boisjoly et al., 2006; Sacerdote, 2001; Zimmerman, 2003). However, these groups pose an external validity problem, as students in military academies may not be representative of the average college student body or a student's network may extend beyond his/her roommates (Carrell, Fullerton, and West, 2009; Stinebrickner and Stinebrickner,

2006). In 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. The next section 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 provides some descriptive analyses characterizing the type of diversity brought about by this policy. In Section III, I present the identification strategy, provide the 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 the paper.

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 one-eighth of the 2,364 tertiary institutions were public, but they accounted for 27.5 percent of the students enroled.[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 durations. The bachelor and licentiate degree programs last, on average, between 4 to 6 years, while 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 that 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 are reserved a spot. No subjective assessment of student quality is required in the admission process. Historically, each university created and administered its own non-standardized entrance exam, called *vestibular*. However, after the imple-

[4]Unless otherwise indicated, all statistics reported thoughout 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.

mentation of a centralized system for public university admissions, commissioned by the Ministry of Education in 2009, most federal and state universities replaced their traditional and specific entrance examinations by the standardized National High School Exit Exam (ENEM) for admitting students.[6]

Public universities, with the exception of municipal universities, are tuition-free and provide the most high-quality education of all universities. This can be seen in Figure 2.1, which shows the distribution of the program's quality scores (known by its Portuguese acronym CPC) by institution type during 2010-2015.[7] Consistently, both federal and state distributions lie equally skewed towards the upper distribution limit, far from the private and municipal distributions. As a consequence, these higher education institutions (HEIs) face 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 that where the university is located, and only approximately 5 percent of the students enroled 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 federally funded universities, 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

[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 from the INEP the list of participating institutions over time. Controlling for the timing in the adoption of the centralized system does not alter the estimated effects, as shown in Section III.B. See Machado and Szerman, 2016 for a first study that examines 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 was the result of either local state laws or the approval of each university council. For a review of the historical process of AA programs, see Valente and Berry, 2016.

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 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 a graduate of a public high school, reflecting the disadvantages in university access faced by those students that cannot afford private schooling. This is due to the better-quality services of private providers at the primary and secondary levels, in contrast to what occurs in 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 a 12.5-percentage-point 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 and, finally, reach 50 percent by 2016. To put these magnitudes in perspective, Figure 2.2 shows the share of quota students by institution in 2011, one year before the law was passed, and the minimum thresholds required up until 2015, which is the last year of available data. In 2011, 46 percent of federal universities had no representation of specially admitted students within their student body. For the remaining 54 percent, a large dispersion was observed, with an average quota student share of 16.7 percent.

More importantly, the law specified that the quota should be implemented uniformly in each program of study offered, preventing the HEIs from deliberately excluding quota students from certain academic areas. Even if a program of study is run parallel at a branch or satellite campus or is offered in different shifts (morning, evening, integral, or night), the institution should apply the quota in each of them.[10] In addition, to guarantee the fulfilment of the quota regulation, the law mandates that the higher education institutions would be monitored and evaluated by a committee composed of members of 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 action in higher education in Brazil has always been heated and mainly circulated around the constitutionality of using race or

[9]Race in Brazil is defined as 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 study to comply with the quota regulation, the predictive power of the instrument could be affected.

ethnicity to determine eligibility. Since 2009, the Democratic Party has advocated the suspension of the admission quota for black students at the University of Brasilia, alleging the violation of Article 5 of the Brazilian Constitution, which protects equality for all citizens, regardless of race. Finally, on 26 April 2012, the Federal Supreme 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 29 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 admissions 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 the pre-university stage, while the census provides information on students enroled in higher education. Individual records from the two datasets were linked using students' unique identifiers.[11]

The 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 on four different subjects (science, 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 most taken standardized test 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 admissions to higher education.[13] The ENEM dataset contains a rich set of

[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 be due to the fact that participation is also possible for students who graduated in previous years and for those above 18 years old that, even though they did not complete high school, intend to use it as a certificate of completion.

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

predetermined attributes of college-seeking students: students' scores (standardized to have a 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 education institutions in Brazil and the programs of study they offer. Since 2009, the census has incorporated individual-level data on students, allowing us to identify in which program/college the student is enroled, the enrolment date, if the student was specially admitted through a quota system and the student status at the university (enroled, graduate, or dropout).

B. Sample Selection and Outcome

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

I link students in each cohort with their test scores on 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] In summary, the final sample consists of $1,159,588$ non-quota students enroled in 101 federal HEIs. As shown in Appendix Table B.1, the matching rate per year increased over time as the ENEM became 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 are 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 the dropout rate hit high. This variable is available from the Census and is recorded at the end of the academic year (December). The *dropout* indicator takes a value of one if the enrolment situation is on leave or canceled and zero otherwise.

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exam.

[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 have lower peer interaction and may not represent the average student population. Among federal institutions, the share of students enroled in distance learning programs is approximately 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 who took the ENEM in previous years and others who obtained access to study programs through the *vestibular* score only.

C. Descriptive Statistics

The representation of quota students at federal universities has grown remarkably, rising from approximately 11 percent for the 2010 cohort to 33 percent for the 2015 cohort. This can be seen in the first row of Panel B of Table 2.1. 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 an average age approaching 44 years. The different measures of educational attainment (master or PhD) and contractual employment schemes (from full-time to hourly contract) of the college staff are substantively similar across years. There is also no appreciable change in the demographics of non-quota students enroled 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. Approximately 30 percent have highly educated parents, and they are equally likely to be female or male. Neither the share of students born in a municipality or state different from the college location nor the distribution of students across programs of study 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 2.3, 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 written 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 obtain a spot in virtue of the policy) belonged to the middle and lower end of the score range.

When comparing students over the period 2010-2015, it can be observed that quota students have an average admission test score below that of non-quota students. Figure 2.4 plots the distributions of ENEM scores for students enroled in federally funded institutions by cohort. The distributions for quota and non-quota students are shown separately. Although there is substantial overlap, the distribution for non-quota students lies to the right of that for quota students in all the years, and the gap becomes more pronounced in the law period (2013-2015).[18]

[17] Appendix Table C.1 reports the same descriptive statistics considering only faculty and non-quota students from state-funded institutions.

[18] The figures in Appendix C show the same distributions for each of the components evaluated in the 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 cells. Here and elsewhere, the terms γ_c and γ_p represent the cohort and program fixed effects, respectively, 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 inflow of quota students, 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 use the pre-law representation as an instrument to capture the 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 2.5. As in Figure 2.2, 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's minimum thresholds per year of 12.5 percent for 2013, 25 percent for 2014 and

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

[20] In Stevenson, 2010, a law mandated gender parity in sports 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.

27.5 percent for 2015. The graphs show that the higher the ranking in 2011 (more representation of quota students), the smaller the change in the share of quota students to comply with the law during 2013-2015 was. They also reveal the institution's 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 were increasing the share in a gradual manner.

Formally, the first-stage equation is as follows:

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

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]

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

To test the consistency of the estimations, I first check that the estimates are robust to the gradual inclusion of a set of covariates. The individual-level controls include gender, age, disability status, indicators for father and mother with a 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 in the 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 III.C, uses students enroled at state institutions as a further control group.

[21] Although the share of quota students can be computed from 2009 onwards, when the Higher Education Census incorporated individual-level data, I use as an instrument the share of quota students in 2011 for the following reasons: (i) as mentioned in Section I.B, 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 2009, in particular, it is not possible to identify in which shift (morning, evening, integral, or night) the student is enroled, which defines the peer's cell of observation in this paper.

[22] The distance instrument takes a value of 0 for 2012.

B. Results

The 2011 quota student representation is a strong predictor of the changes in the share of quota students, as shown in Table 2.2. This table reports the first-stage estimates. Panel A shows estimates when using the interaction instrument, as defined in (2), while the 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 the 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 the unobserved regional characteristics that evolve over time.

Throughout Columns 1 to 4 of Table 2.2, the coefficients remain significant (at the 1 percent level) and almost constant (with an average point estimate of approximately -0.55). The negative point estimates imply that the lower the representation of quota students in 2011 in a given program was, the larger the increase in the share of quota students, in comparison to those with a higher share of quota students before the law was passed. The stability of the coefficients alleviates concerns that the pre-law quota student representation captures other time-varying student and program attributes. The fact that the results are robust to the gradual inclusion of additional control variables leads me to consider only the final specification in what follows.

To test that the relationship described above reflects the 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 exempt from the new quota regulation, I estimate (2) and (3) using only students enroled at state institutions. Note that, although not required to do so, state universities may have voluntarily chosen to increase their affirmative action quotas. Nevertheless, if this is the case, we should observe a significantly smaller effect than that for federal universities. The results of this placebo test are presented in Columns 5 of Table 2.2. 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 as those enroled in federal institutions, but the magnitudes are much smaller and not always significant (and with a F-statistic on the excluded instruments equal to 2.630 in Panel A and to 2.342 in Panel B). As anticipated, this may reflect the fact that these state universities choose to meet an informal quota

with time, albeit low.

Table 2.3 reports the estimates of quota student share on non-quota student dropout. The OLS estimates (Column 1) suggest that, on average, a unit change in QSS generates a 0.068-percentage-point reduction in the probability that a non-quota student drops out 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 the treatment effects are relative to the period immediately prior to the regulation coming into force. This means that, compared to the 2012 dropout, the probability that a non-quota student drops 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 the probability of non-quota student dropout. The fact that the increase in the representation of quota students has no effect on the dropout rate of non-quota students presumably reflects that dropout decisions are more related to the background characteristics of the student (i.e., low achievement) and less sensitive to peer composition.

Although the change in the representation of quota students mandated by the law varies according to the pre-quota share, one concern about the validity of this analysis is that the share of quota students in 2011 is not random. For example, if the share in 2011 is related to subsequent changes in the 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 institutional characteristics of federal universities with a quota student representation in 2011 below and above 12.5 percent, the minimum threshold for 2013.

The results of this balance test are presented in Table 2.4. Institutions with a low share of quota students in 2011 are more likely to be located in the northern region and be smaller in size. There is no difference between the two groups in terms of faculty educational level, research budget and work stability. Notably, the dropout of non-quota students is not significantly 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.

[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. The estimates are virtually identical.

C. Alternative Identification Strategy

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

There are a number of motivations for this test. On the one hand, it alleviates concerns about the unobserved trends related to (i) changes in the 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 the dropout rates of students attending federal universities due to, for example, other regulations specific to this sector. On the other hand, the difference-in-differences 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 a value of one for study programs offered by federally funded institutions and 0 for those offered by 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 students 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 the dropout rate by students in federal universities with an initial low share of quota students after adjusting for trends using students in state-funded universities. To

[24] For the sample of state universities, approximately 63.6 percent of the student population was matched with their corresponding high school exit exam score, giving a total of 440,886 students enroled in 97 state HEIs.

check whether differential effects exist over time, I also estimate an analogous event study, replacing the $Post_c$ indicator with the full set of cohort dummies.

As distinct pre-existing 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 2.5. I test the parallel trend assumption in two different ways: using a constant linear time trend (Panel A) and using cohort (year) dummies (Panel B). In the latter case, the 2010 cohort dummy was omitted. The first four columns of Table 2.5 are based on a difference-in-differences 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 those enroled 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 enroled in any federally funded universities. Finally, Columns 5 and 6 combine both treatments, testing whether the difference in dropout of non-quota students enroled 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 columns, the $Federal_p$ indicator is replaced by institutional 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 2.6 reports the triple-difference estimates based on (4). Columns 1 and 2 correspond to the specification that considers the whole period 2010-2015, with 2010 being the reference year. Columns 3 and 4 show the estimation results for the 2012-2015 period, fully consistent with the main instrumental variable specification. While in Columns 1 and 3, I use the $Post_c$ variable to capture the aggregated effect from 2013 to 2015, in Columns 2 and 4, I disaggregate the effect using instead cohort (year) dummies. The 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 universities affected the dropout of their non-quota peers.

D. Coincident Changes in Non-Quota Students and Supply

An obvious concern regarding 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 discourages the applications of non-quota students that otherwise would enrol in federal universities, and that the incomers' hazards of dropping out balanced each other out 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 seem to remain stable across cohorts except for entry qualifications. This is apparent from Table 2.7, which shows the reduced-form specification replacing the dropout dummy on the left-hand side with student's pre-determined characteristics. From Columns 1 to 10, it is possible to observe that gender, age, race and parent education level are orthogonal to the inflow of quota students. Table 2.8 confirms the graphical evidence shown in Figure 2.3. Non-quota students seem to be more academically prepared during 2013-2015, as shown by the significantly higher ENEM scores, especially in math and the written essay.

I then report the estimates from specifications identical to those used to construct the estimates in Table 2.3 but for the sample of high-achiever 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. The results are in line with the earlier documented impact using all non-quota students and presented in Table 2.9. Paralleling Table 2.3, Column 1 reports the OLS estimates, Columns 2 and 3 report the coefficients from the reduced-form specification, and the last two columns present the 2SLS estimates. The 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 on the left-hand side university staff characteristics. The results are shown in Table 2.10. With the exception of age, there seems to be no significant measurable impact of the inflow of quota students on faculty attributes.

Several competing hypotheses 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-achiever 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 perform 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 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 the inflow of quota students on the academic performance of non-quota 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.

The affirmative action policy works as expected. The representation of historically underrepresented students increases considerably within each university program. Results also show that quota students displaced non-quota students from the lower end of the score distribution in the university entrance exams. Besides all these changes, the inflow of quota students has no effect on the dropout of non-quota peers. If anything, the effects for high-achiever non-quota students is that they drop out less.

These results do not necessarily imply that affirmative action have no consequences on non-quota peers. The only outcome available at the time of this analysis is student dropout, which may be less sensible to changes in the student body composition than to individual characteristics (Guryan, 2004). A natural direction for further research is evaluating the effect of the quota student inflow on college test scores and to extend the analysis to the performance of quota students.

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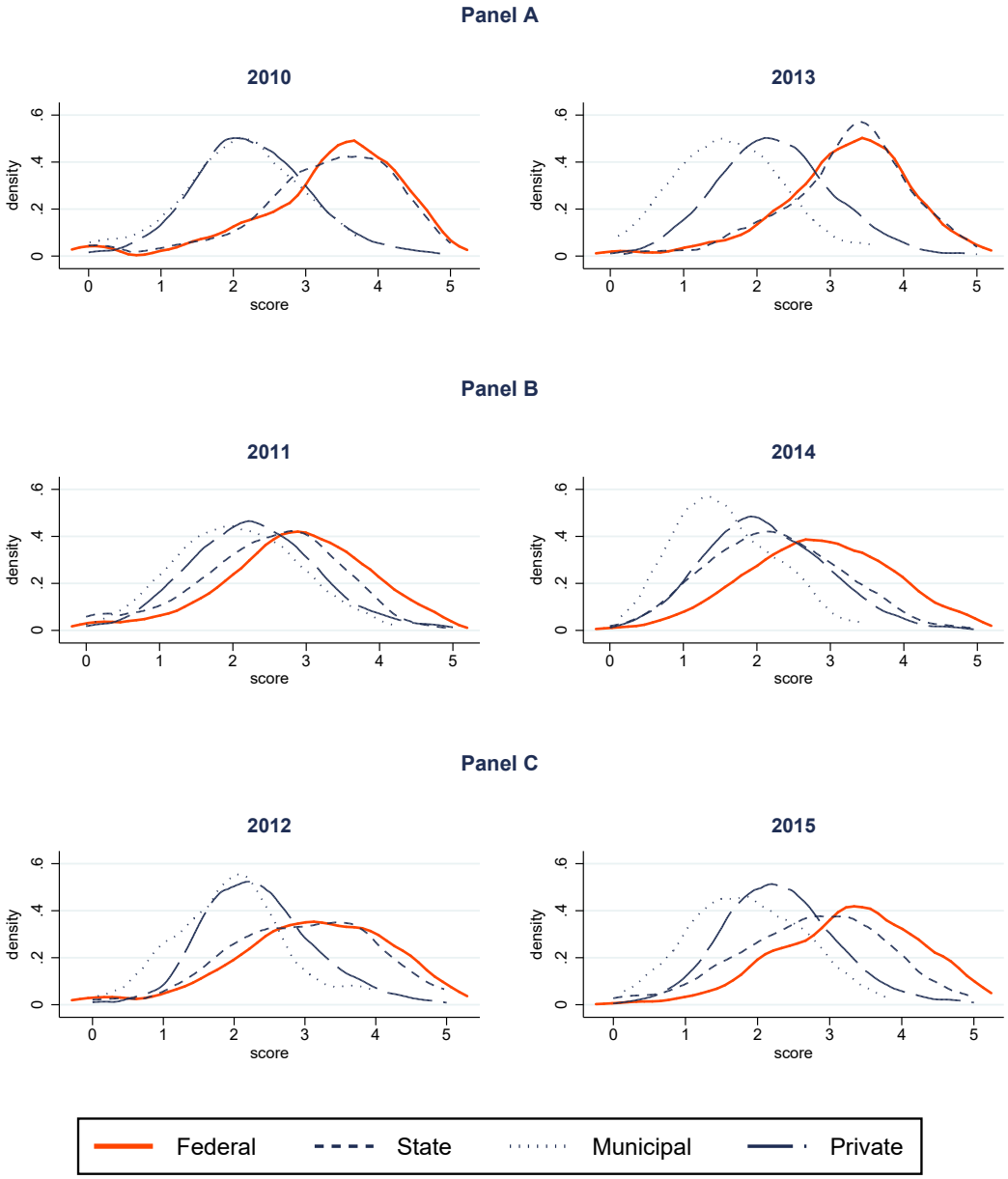
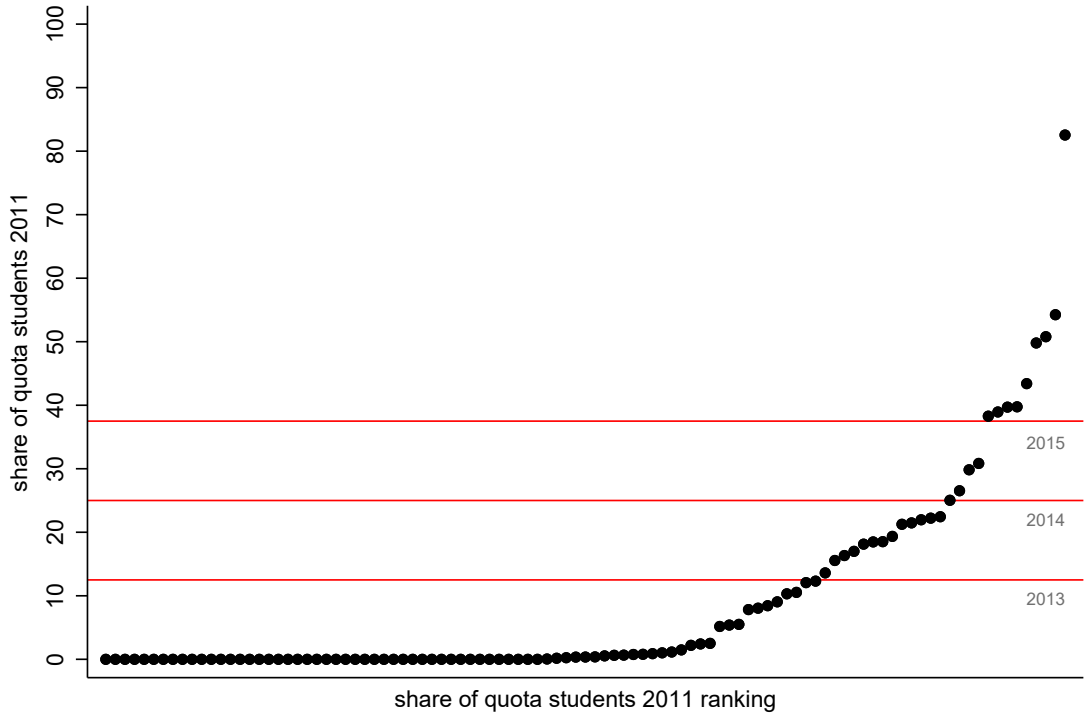
Figure 1 – Study Program Quality by Institution Type



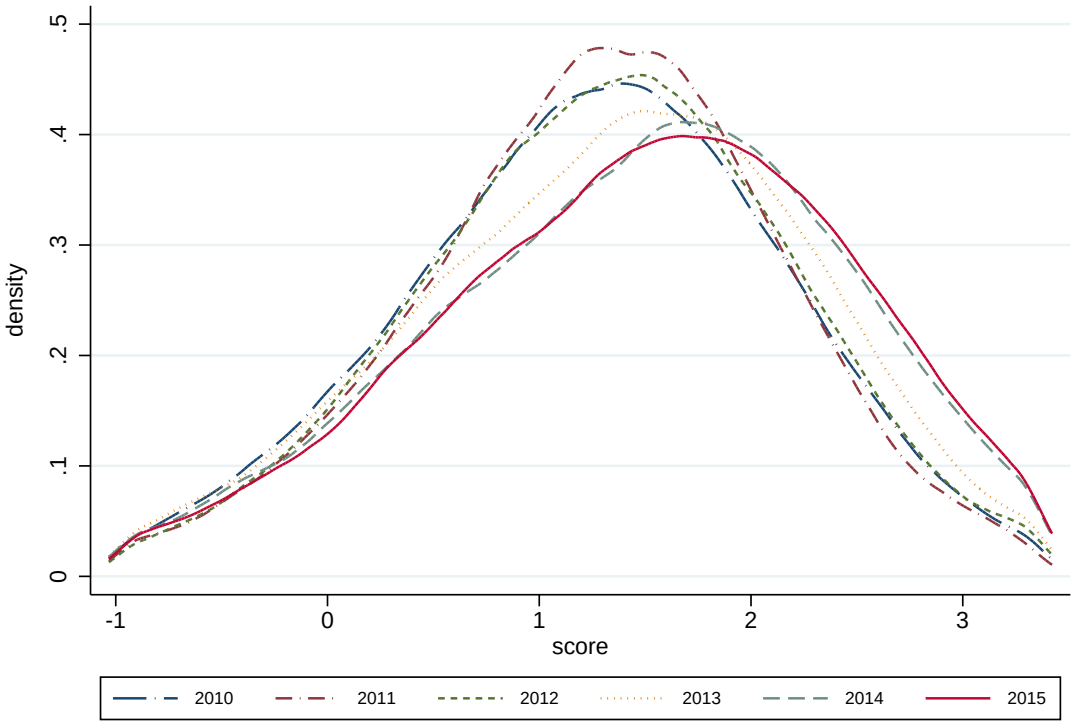
Notes: Figures show kernel density distributions of the program scores by institution type: Federal, State, Municipal and Private. The program of study quality score is a continuous variable in the range between 0 and 5, where 5 is the top score. The assessment is based on infrastructure, teaching-learning 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



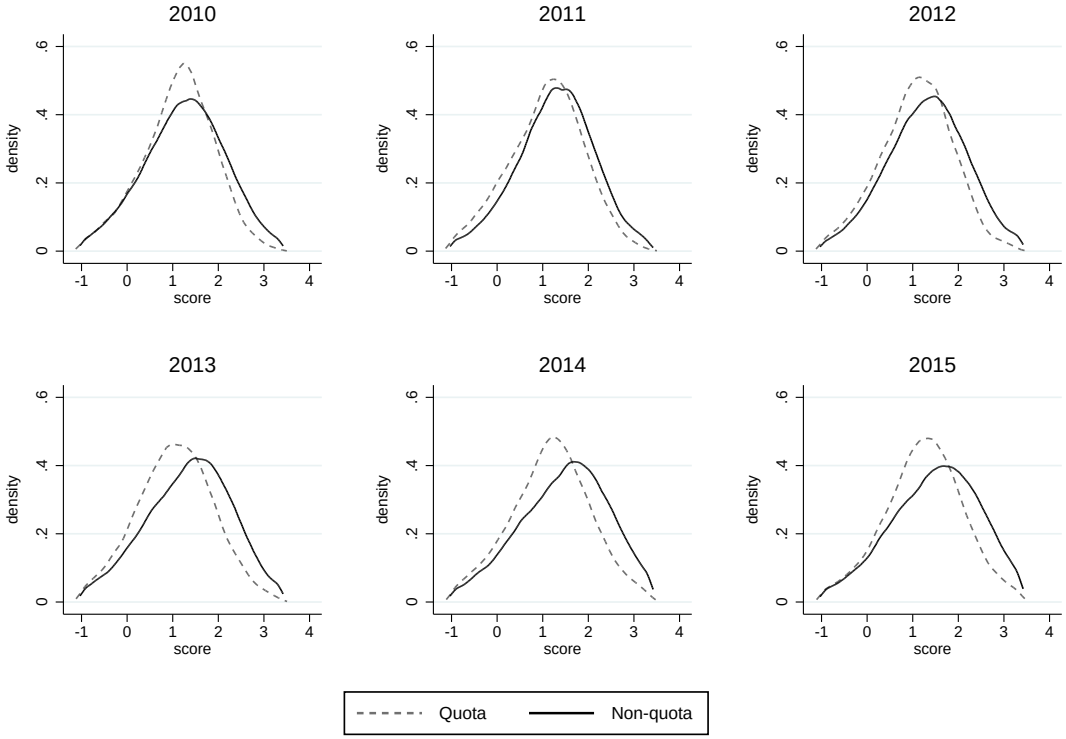
Notes: Dots represent federal universities. Institutions are ranked according to their quota students representation in 2011, and ties are broken randomly. The horizontal lines show the quota minimum threshold of 12.5 percent, 25 percent and 37.5 percent imposed by the *Lei das Cotas* for 2013, 2014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

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



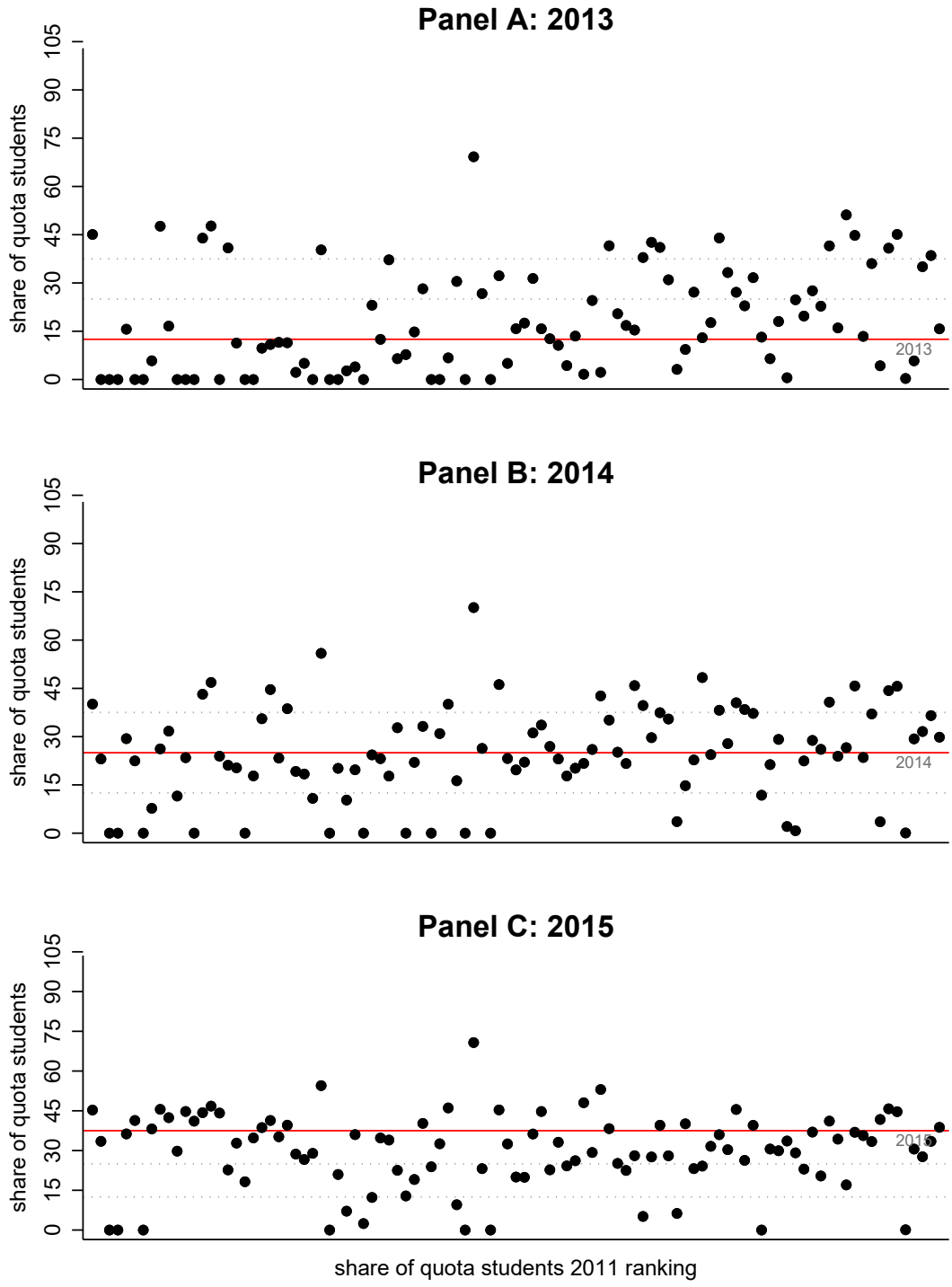
Notes: Each line plots the kernel density of the standardized ENEM scores. The score is the average of the five components of the high school exit exam (Sciences, Humanities, Portuguese, Math and writing essay), standardized to be mean zero unit variance for all test-takers each year. Sample: non-quota 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 students 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. Students and Faculty at Federal Universities

	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

Table 1 – Summary Statistics. Students and Faculty at Federal Universities (cont.)

	Enrollment Cohort						Diff
	2010	2011	2012	2013	2014	2015	2015-2010
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

	Dependent variable: Share of Quota Student				
	Federal				State
	(1)	(2)	(3)	(4)	(5)
Panel A: Interaction Instrument					
$QSS_{2011p}\mathbb{1}(c=2013)$	-0.444***	-0.446***	-0.444***	-0.425***	-0.112*
	(0.110)	(0.111)	(0.113)	(0.123)	-0.065
$QSS_{2011p}\mathbb{1}(c=2014)$	-0.572***	-0.578***	-0.580***	-0.541***	-0.061
	(0.121)	(0.121)	(0.122)	(0.139)	-0.106
$QSS_{2011p}\mathbb{1}(c=2015)$	-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					
$QSS_{2011p} - \zeta_c$	-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

	Dependent variable: Dropout				
	OLS	Reduced-form		2SLS	
		Instrument Interaction	Instrument Distance	Instrument Pre-share	Instrument Distance
	(1)	(2)	(3)	(4)	(5)
QSS_{cp}	-0.068***			-0.143***	-0.083***
	(0.024)			(0.014)	(0.015)
$QSS_{2011p}\mathbb{1}(c = 2013)$		-0.006			
		(0.035)			
$QSS_{2011p}\mathbb{1}(c = 2014)$		0.070			
		(0.046)			
$QSS_{2011p}\mathbb{1}(c = 2015)$		0.122***			
		(0.041)			
$QSS_{2011p} - \zeta_c$			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

	QSS_{2011} >= 12.5%	QSS_{2011} < 12.5%	p-value
	(1)	(2)	(3)
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
Size	4128.0	2325.9	0.006
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
Postgraduate	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
Public High School	24.0	55.1	0.003
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

	Federal Universities		Federal and State Universities			
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Linear Trend						
$\mathbb{1}(QSS_{2011} >= 12.5\%) \cdot Time\,trend$	0.0146	0.0101				
	(0.0254)	(0.0121)				
$Federal \cdot Time\,trend$			-0.0019	0.0011		
			(0.0107)	(0.0096)		
$\mathbb{1}(QSS_{2011} < 12.5) \cdot Federal \cdot Time\,trend$					0.0098	0.0071
					(0.0270)	(0.0130)
Panel B: Cohort Dummies						
$\mathbb{1}(QSS_{2011} < 12.5) \cdot \mathbb{1}(c = 2011)$	-0.0313	-0.0215				
	(0.0494)	(0.0368)				
$\mathbb{1}(QSS_{2011} < 12.5) \cdot \mathbb{1}(c = 2012)$	-0.002	0.0069				
	(0.0505)	(0.0372)				
$Federal \cdot \mathbb{1}(c = 2011)$			0.0112	-0.0184		
			(0.0081)	(0.0178)		
$Federal \cdot \mathbb{1}(c = 2012)$			0.0259***	0.0012		
			(0.0098)	(0.0194)		
$\mathbb{1}(QSS_{2011} < 12.5) \cdot Federal \cdot \mathbb{1}(c = 2011)$					0.0454	0.0322
					(0.0516)	(0.0351)
$\mathbb{1}(QSS_{2011} < 12.5) \cdot Federal \cdot \mathbb{1}(c = 2012)$					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

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

	Female	Age	White	Disabled	High-educ Father	High-educ Mother	Public Primary	Public Secondary	Migrant State	Migrant Municip.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Interaction Instrument										
$QSS_{2011p}\mathbb{1}(c=2013)$	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)
$QSS_{2011p}\mathbb{1}(c=2014)$	-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)
$QSS_{2011p}\mathbb{1}(c=2015)$	-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										
$QSS_{2011p} - \zeta_c$	-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 8 – Reduced-form Estimates of the Effect of Quota Students on Non-quota Students' ENEM performance

	Natural Science	Human Science	Portu-guese	Math	Essay	Total
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Interaction Instrument						
$QSS_{2011p}\mathbb{1}(c = 2013)$	0.001	0.001	0.001	0.001	0.002*	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$QSS_{2011p}\mathbb{1}(c = 2014)$	0.003**	0.002*	0.002*	0.002*	0.005***	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
$QSS_{2011p}\mathbb{1}(c = 2015)$	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						
$QSS_{2011p} - \zeta_c$	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: Columns 1-5 report estimates of a regression where the dependent variable is the (pre-university) subject test score, as defined in the head of each column. All subject scores were standardized to have zero mean and standard deviation equal to one. Column 6 reports regression estimates for total achievement in ENEM (sum of test scores in all subjects), standardized to have zero mean and standard deviation of one across all test-takers. 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 9 – Quota Students Share and Dropout of High-Achiever Non-quota Students

	Dependent variable: Dropout				
	OLS	Reduced-form		2SLS	
		Instrument Interaction	Instrument Distance	Instrument Pre-share	Instrument Distance
	(1)	(2)	(3)	(4)	(5)
QSS_{cp}	-0.087***			-0.218*	-0.147
	(0.029)			(0.112)	(0.103)
$QSS_{2011p}\mathbb{1}(c = 2013)$		0.011			
		(0.043)			
$QSS_{2011p}\mathbb{1}(c = 2014)$		0.119**			
		(0.059)			
$QSS_{2011p}\mathbb{1}(c = 2015)$		0.172***			
		(0.056)			
$QSS_{2011p} - \zeta_c$			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-achiever 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 10 – Reduced-form Estimates of the Effect of Quota Students on Non-quota Students' Characteristics

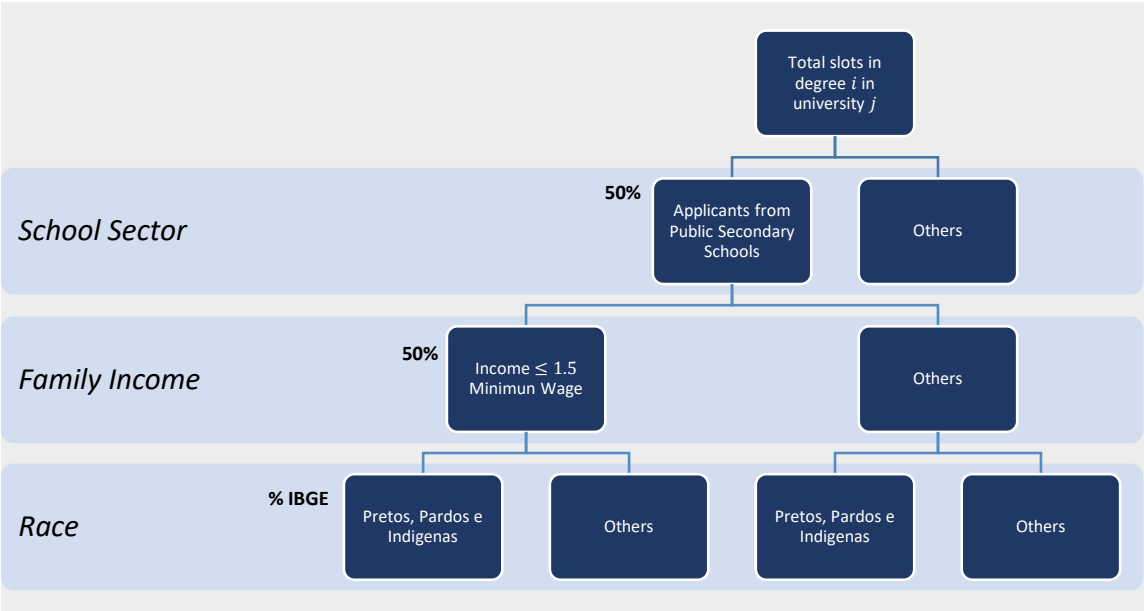
	Female	Age	White	Foreigner	Master Degree	PhD Degree	Full Time Contract	Research Grant
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Interaction Instrument								
$QSS_{2011p}\mathbb{1}(c = 2013)$	-0.014	1.765**	0.012	0.003	-0.001	-0.042	-0.061*	0.388
	(0.027)	(0.733)	(0.136)	(0.009)	(0.025)	(0.037)	(0.034)	(0.241)
$QSS_{2011p}\mathbb{1}(c = 2014)$	-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)
$QSS_{2011p}\mathbb{1}(c = 2015)$	-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								
$QSS_{2011p} - \zeta_c$	-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).

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

Student Cohort	Federal				State			
	Census		Matched	Matching Rate	Census		Matched	Matching Rate
	Students	Missing ID			Students	Missing ID		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
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

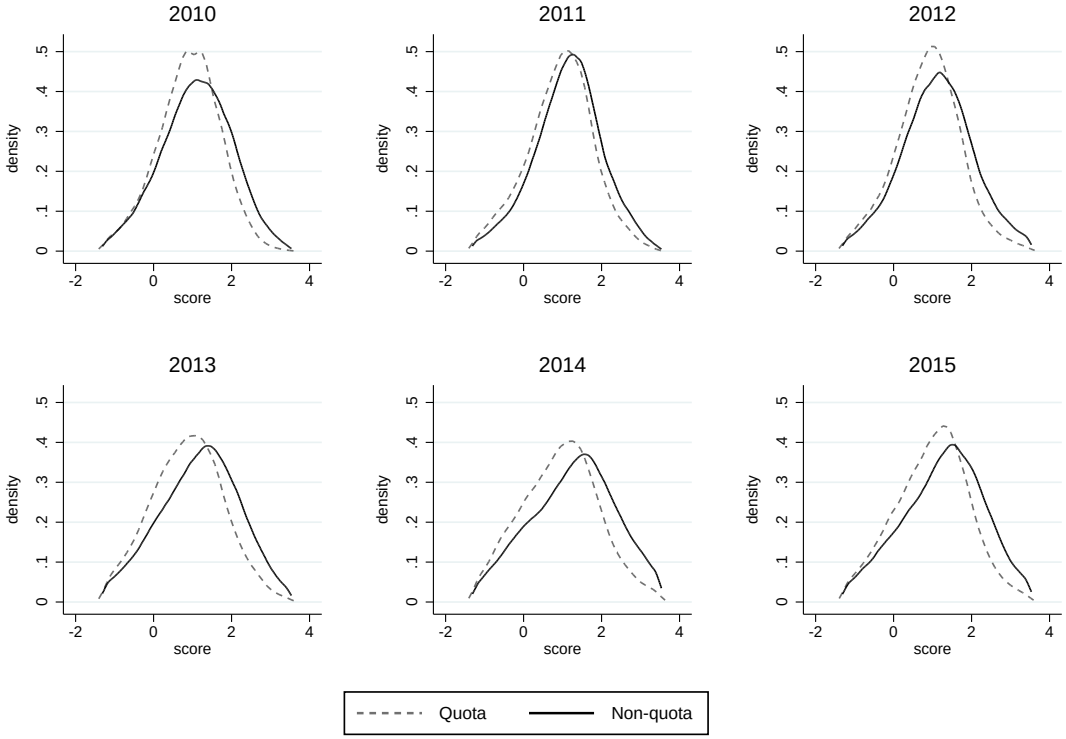
	Enrollment Cohort						Diff
	2010	2011	2012	2013	2014	2015	2015-2010
Panel A: Faculty Characteristics							
Female	0.468(0.499)	0.472(0.499)	0.467(0.499)	0.462(0.499)	0.460(0.498)	0.469(0.499)	0.001
Age	45.9(10.7)	45.6(10.8)	45.7(10.9)	45.8(10.9)	45.9(10.9)	45.8(10.9)	-0.100
White	0.802(0.399)	0.780(0.414)	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

Table C1– Summary Statistics. Students and Faculty at State Universities (cont.)

	Enrollment Cohort						Diff
	2010	2011	2012	2013	2014	2015	2015-2010
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

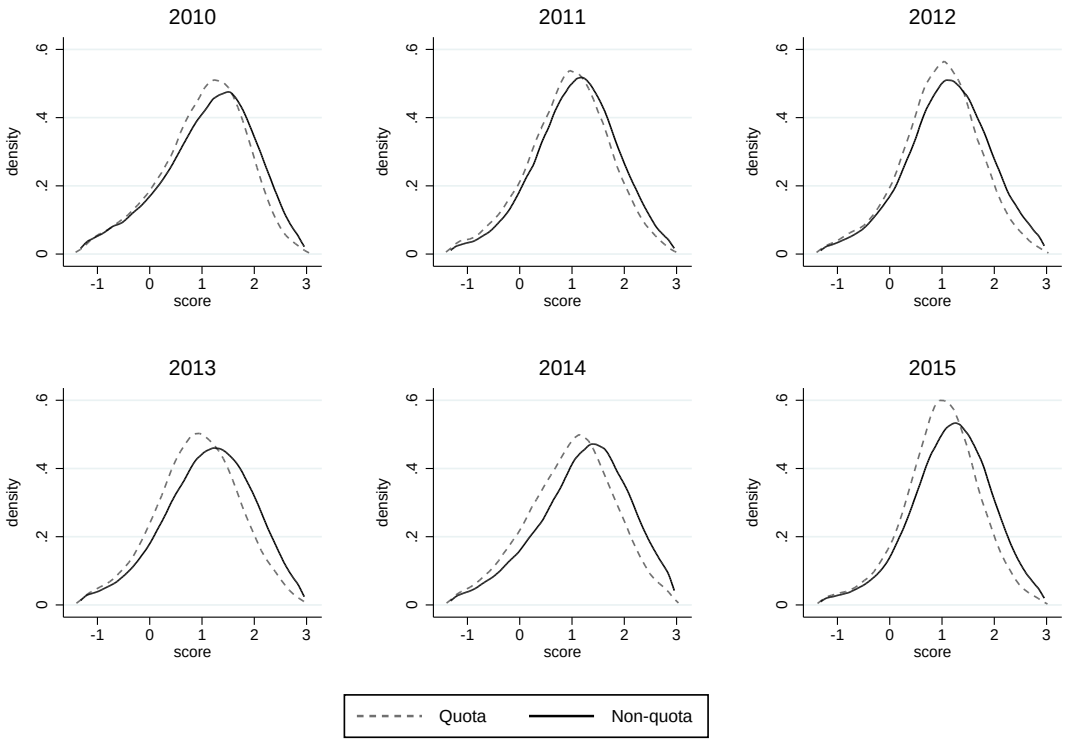
Notes: Numbers show mean values. Standard deviations are in parentheses. The first 6 columns report cohort averages starting with cohort 2010 in column 1 through cohort 2015 in column 6. The last column reports the difference between the average values for the 2015 cohort and the 2010 cohort. Sample: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

Figure C1 – Sciences High School Score by Special Admission Status



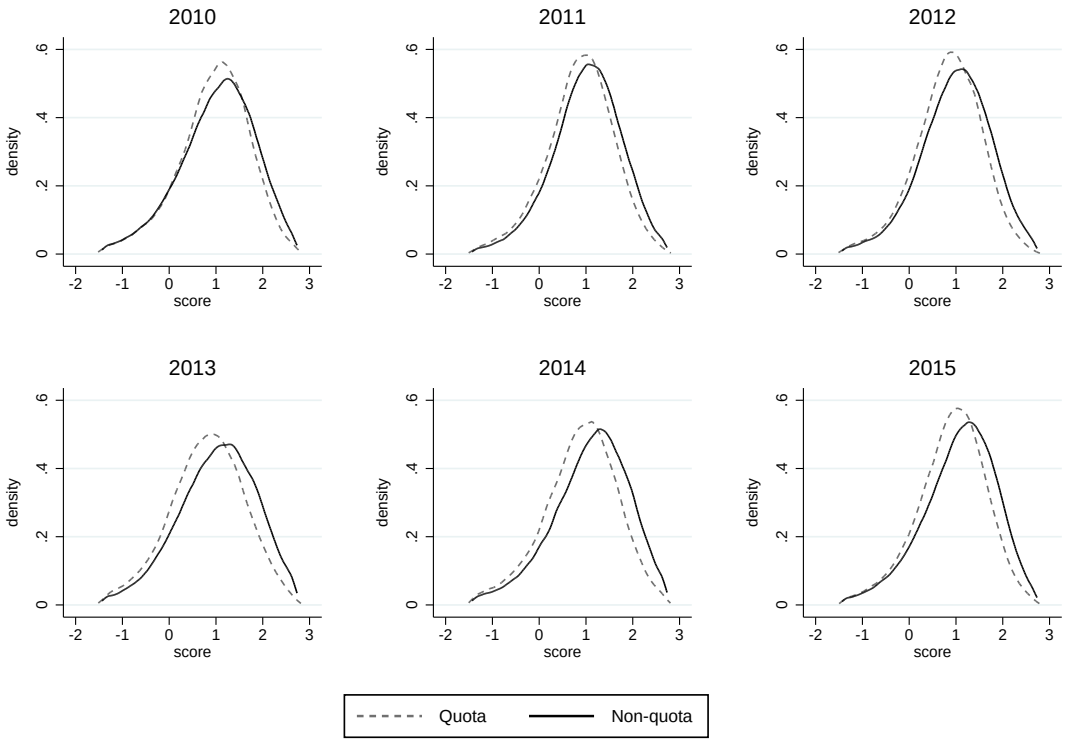
Notes: Each line plots the kernel density distribution of the Natural Science ENEM scores for quota and non-quota students. The score is standardized to be mean zero unit variance for all test takers each year. Sample: students in federal universities. Source: National High School Exam (ENEM).

Figure C2 – Humanities High School Score by Special Admission Status



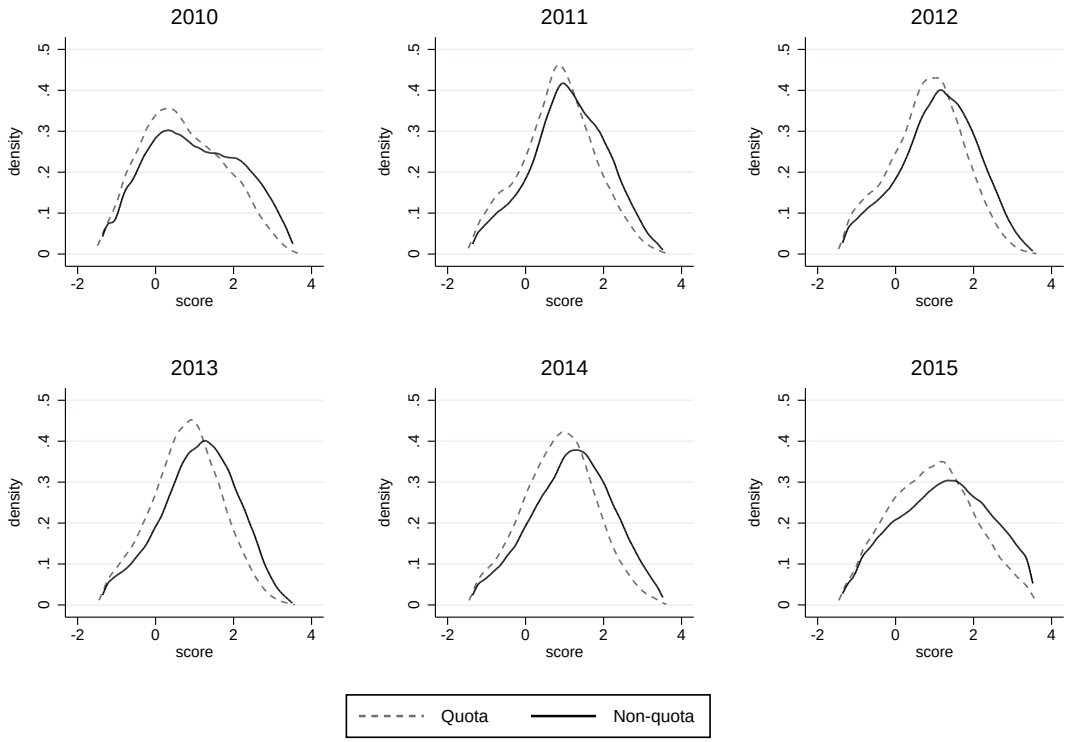
Notes: Each line plots the kernel density distribution of the Human Science ENEM scores for quota and non-quota students. The score is standardized to be mean zero unit variance for all test takers each year. Sample: students in federal universities. Source: National High School Exam (ENEM).

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).