

Using Brazil's Racial Continuum to Examine the Short-Term Effects of Affirmative Action in
Higher Education

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In 2004, the University of Brasilia established racial quotas. We find that quotas raised the proportion of black students, and that displacing applicants were from lower socioeconomic status families than displaced applicants. The evidence suggests that racial quotas did not reduce the pre-university effort of applicants or students. Additionally, there may have been modest racial disparities in college academic performance among students in selective departments, though the policy did not impact these. The findings also suggest that racial quotas induced some individuals to misrepresent their racial identity but inspired other individuals, especially the darkest-skinned, to consider themselves black.

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I. Introduction

Brazil is a paradox insofar as it is known both for its racial diversity and also for its racial inequality. Undoubtedly, this is the consequence of being the country that had received the greatest number of slaves during the Trans-Atlantic Slave Trade (Eltis 2001). Today, about half of the population is branco, or light-skinned, 44.2 percent pardo, or brown-skinned, and 6.9 percent preto, or dark-skinned (IBGE 2010).¹ Growing recognition of persistent racial disparities in education, income, and other outcomes is beginning to spur efforts to reevaluate and reformulate public policies in Brazil (Telles 2004).

In this paper, we examine the experience of the University of Brasilia (UnB), which established racial quotas in July 2004, making it the first federal university in the country and the only university in the region to do so. At UnB, 20 percent of available admissions slots are reserved for students who self-identify as negro, or black.² Those who are selected for admission under the quota system are required to attend an interview with a university panel to verify that they are "black enough" to qualify.³ That the policy change was so simple while the racial environment so complex makes Brazil an ideal place to examine important academic and policy questions about affirmative action.

The objectives of the paper are to estimate the effect of the policy on the racial and socioeconomic profile of UnB students, pre-university effort of applicants and students, racial gaps in college academic performance, and black identity of applicants and students. To this end, the authors conducted a survey of UnB students who matriculated between 2003 and 2005, a period including two admissions cycles before quotas and three after. Also, the authors were provided with admissions records and a survey of applicants who took the university entrance exam during the period. All in all, we obtained data on more than 2,000 students and 24,000

applicants making this one of the largest studies on affirmative action in higher education.

Moreover, it is one of the first to use individual-level data to examine the introduction of an affirmative action program, the first to identify separate effects by skin tone, and one of the few to study the construction of racial identity.

In summary, we find that racial quotas raised the proportion of black and dark-skinned students at UnB, and that displaced applicants were, by many measures, from families with significantly lower socioeconomic status than displaced applicants. While in theory affirmative action might increase or decrease effort, the evidence indicates that racial quotas did not reduce the pre-university effort of either applicants or students. Additionally, the evidence is inconsistent with the contention that the intended beneficiaries of affirmative action are worse off because they are placed in colleges with academic standards they are unable to meet. Factors independent of the policy, including racial differences arising prior to college attendance, appear to be driving any racial disparities in college academic performance. The findings also suggest that racial quotas induced some individuals to misrepresent their racial identity but inspired other individuals, especially the darkest-skinned, to genuinely consider themselves black. These results are consistent with the incentives created by the policy. Indeed, the incentive to apply under the quota system was substantial given the competitiveness of admissions, and programs for quota students reinforced and fostered investments in black identity.

The remainder of the paper is organized as follows. Section II reviews related literature. Section III provides background information on racial inequality in Brazil and racial quotas at UnB. Section IV describes the data and empirical strategy. Section V presents the results, and Section VI concludes.

II. Previous Literature

The findings in this paper build on three distinct, but interrelated areas of research: affirmative action, race, and identity.

First, this paper contributes to the literature on affirmative action. Economists have long been interested in race-targeted policies (Coate and Loury 1993; Donohue and Heckman 1991; Fryer and Loury 2005a, 2005b; Holzer and Neumark 2000; Leonard 1984a, 1984b, 1984c; Smith and Welch 1984). Most research focuses on the United States, but some focuses on India, Brazil, and other developing countries. A number of studies investigate the effect of eliminating affirmative action in higher education. Theory papers propose efficiency justifications for retaining or discarding racial preferences in college admissions (Abdulkadiroglu 2005; Chan and Eyster 2003; De Fraja 2005; Epple, Romano, and Sieg 2008; Fryer, Loury, and Yuret 2008). Empirical papers, many of which use individual-level data to examine Texas and California, largely suggest that dismantling or replacing affirmative action would lower the enrollment of minority students in college (Bucks 2004; Card and Krueger 2005; Conrad and Sharpe 1996; Dickson 2006; Kain, O'Brien, and Jargowsky 2005; Long 2004a, 2004b; Tienda, Alon, and Niu 2008). Similarly, this paper is concerned with the effect of affirmative action on the enrollment of historically underrepresented racial groups, although it is studying the introduction, not elimination, of the policy.

Empirical studies also examine the academic performance of minorities and subsequent gains to minorities in the labor market (Arcidiacono 2005; Loury and Garman 1993; Rothstein and Yoon 2008). They generally find that the labor market gains of minorities tend to outweigh the potential costs of "mismatch," the possibility that the intended beneficiaries of affirmative action may be worse off because they are matched with excessively difficult colleges and jobs.

Based on tabulations of UnB admissions and academic records, Cardoso (2008) investigates differences in attrition and college grades between quota and non-quota students. She finds that quota students exhibited lower attrition rates than non-quota students, and they had comparable grades except in selective departments of study. This paper builds on prior work by using measures of self-reported and non-self-reported race/skin tone and by employing a difference-in-difference framework to estimate the effect of quotas on racial gaps in college academic performance.

India has had quotas for underrepresented castes for a number of years (Desai and Kulkarni 2008). Bertrand, Hanna, and Mullainathan (2010) evaluate the efficiency of a quota system at an engineering college in an Indian state. To do so, the authors interviewed about 700 households from the college applicant pool about eight to ten years after the entrance exam. Their findings suggest that the program successfully targeted poorer students who, in spite of lower entrance exam scores, enjoyed substantial gains in the labor market. However, the gains for marginal upper-caste students were larger than those for marginal lower-caste students. While this paper does not examine labor market outcomes, it adapts the methodology developed in Bertrand, Hanna, and Mullainathan (2010) to identify and compare displacing and displaced applicants, as India and Brazil have roughly analogous university admissions and quota systems.

Theoretical research explores the relationship between preferences in admissions and pre-university investments (Fryer and Loury 2005a; Fryer, Loury, and Yuret 2008; Holzer and Neumark 2000). Changes in admissions standards might relocate some individuals who otherwise would have had little chance of selection to the margin of selection, thereby inspiring effort. Alternatively, changes in admissions standards might relocate some individuals who otherwise would have been at the margin of selection to an intra-marginal position, thus reducing

effort. Essentially, these studies maintain that affirmative action has a theoretically ambiguous effect on effort. This is largely an open question empirically. Ferman and Assunção (2005) use data from Brazil to study the issue. They find that black secondary school students who resided in states with a university with racial quotas had lower scores on a proficiency exam, which they argue indicates that racial quotas lowered effort. Nevertheless, Ferman and Assunção (2005) are unable to identify which students applied to college and which did not. The estimates are rather large given that the average black secondary school student would have had only a small chance of admission. Moreover, self-reported racial identity may be correlated with the adoption of quotas making the results challenging to interpret. This paper aims to build on this work by focusing on applicants and students, employing multiple measures of effort, and using both self-reported and non-self-reported race/skin tone.

Second, this paper contributes to the literature on race and skin shade. A number of papers demonstrate the significance of skin tone—beyond the influence of race—in education, employment, and family (Bodenhorn 2006; Goldsmith, Hamilton, and Darity 2006, 2007; Hersch 2006; Rangel 2007). For example, using survey data from the US, Goldsmith, Hamilton, and Darity (2007) find evidence consistent with the notion that the interracial and intraracial wage gap increases as the skin tone of the black worker darkens. Analogously, Hersch (2006) finds evidence that black Americans with lighter skin tone tend to have higher educational attainment than those with darker skin tone. Allowing the possibility that the policy might impact applicants and students of different skin tone in different ways, this paper estimates separate effects by self-reported race/skin tone (branco, pardo, preto) and by skin tone quintile derived from photo ratings.

Lastly, this paper contributes to the literature on identity. A growing body of literature analyzes the construction of identity and the role of identity in behavior (Akerlof and Kranton 2000, 2002; Austen-Smith and Fryer 2005; Darity, Dietrich, and Hamilton 2005; Darity, Mason, and Stewart 2006; Francis 2008; Fryer et al. 2008; Golash-Boza and Darity 2008; Ruebeck, Averett, and Bodenhorn 2009). To explain a wide range of behaviors and outcomes, Akerlof and Kranton (2000) propose a model where utility is a function of identity, the actions taken by the individual, and the actions taken by others. Darity, Mason, and Stewart (2006) develop a game theoretic model to study the relationship between racial identity formation and interracial disparities in outcomes. Exploring the construction of identity empirically, Darity, Dietrich, and Hamilton (2005) report that despite high African-descended population shares in some Latin American countries, Latinos living in the US largely demonstrate a preference for self-identifying as white and an aversion to self-identifying as black. They emphasize that racial self-identification involves choice and suggest that future research on race and social outcomes treat race as an endogenous variable. Theories of identity are complex and challenging to test. This paper is one of the few to study the construction of racial identity in the context of a relatively simple policy change. Isolating one dimension of the dynamic forces that shape identity, this paper offers evidence that racial identity may respond to the incentives created by an affirmative action policy.

III. Background and Policy

Forever tarnished is Brazil's image as a perfect racial democracy. Many scholars have documented significant racial disparities in a number of outcomes (Francis and Tannuri-Pianto 2012; Lovell and Wood 1998; Telles 2004; Theodoro et al. 2008; Wood and Lovell 1992). For

clarity, Table 1 defines the Portuguese racial terms that we use throughout the paper. Table 2 illustrates the correlations between race and socioeconomic status. In the top panel, statistics for young adults (15-24 year olds) living in Distrito Federal are based on a national survey of Brazilians (PNAD 2004). In the middle and bottom panels, statistics for UnB applicants and students are based on data obtained by the authors. Echoing a point that many other papers make, the table shows that pretos tend to have lower socioeconomic status than pardos, and pardos tend to have lower socioeconomic status than brancos.

In 2001, two state universities in Rio de Janeiro became the first to adopt racial quotas in admissions. A handful of universities, including the University of Brasilia (UnB), followed suit. UnB, a tuition-free public institution, remains one of the best universities in Brazil. It is located in Brasilia, a city of 3.5 million and the capital of Brazil. Most undergraduates are from the local state of Distrito Federal and are admitted through the "vestibular" system. Applicants typically apply to only two or three universities. To apply to UnB, which has biannual admissions, applicants select one academic department and take a UnB-specific entrance exam called the vestibular. The overall score on the vestibular is the primary basis for admission, and the minimum score for selection varies by department. Applicants are either admitted or rejected by their chosen department. About three-fourths of those admitted matriculate. Those who are rejected often retake the vestibular, some selecting the same department and others selecting a less competitive one.

UnB implemented racial quotas in July 2004 making it the first federal university in the country and the first university in the region to have a race-targeted admissions policy. The administration adopted the policy without public vote or debate and announced it on June 6, 2003. The principal objectives of the policy are to reduce racial inequality, address historical

injustices, raise diversity on campus, and enhance awareness of blacks in society. To participate, upon registration for the vestibular, applicants must elect to apply under the quota system and self-identify as negro. 20 percent of each department's allotted vestibular admissions slots are reserved for students who self-identify as negro and choose admission through racial quotas. To prevent abuse of the policy, all candidates selected for admission under the quota system are interviewed by a university panel. UnB provides to quota students an array of programs that support their academic and social development, including tutoring services, public seminars on the value of blacks in society, and a campus meeting space to study and interact.

Table 3 provides a snapshot of admissions standards in 2004. For individuals who applied under the non-quota system, the non-quota admissions score (NQ) was the minimum score necessary for selection. For those who applied under the quota system, the quota admissions score (Q) was the minimum score necessary for selection. Minimum scores were entirely determined by the number of admissions slots allocated to the department (20 percent of which were reserved for quota applicants) and the vestibular scores of those applying to the department under the non-quota and quota systems.⁴ In the table, NQ and Q are displayed as percentile scores. As is apparent, variability in admissions standards across departments was enormous. Extremely selective courses of study were medicine, law, and engineering, whereas less selective courses were geography, library science, and fine arts. For most departments, the non-quota admissions score was greater than the quota admissions score, indicating that standards were lower for some quota students. Most applicants had scores below Q and were not admitted. Those admitted included non-quota applicants with scores above NQ, quota applicants with scores above NQ, and quota applicants with scores between Q and NQ. If the quota system had not existed, some of the non-quota applicants with scores between Q and NQ would have been

admitted, while some of the quota applicants with scores between Q and NQ would not have been.

IV. Data and Empirical Strategy

A. Student Sample (PSEU)

The authors conducted a survey of UnB students who were admitted through the vestibular system and matriculated between 2003 and 2005, a period including two admissions cycles before quotas (2-2003 and 1-2004) and three after quotas (2-2004, 1-2005, and 2-2005). We refer to this survey by its Portuguese acronym PSEU. Interviews, done online and face-to-face with an interviewer, covered a variety of topics: family background, pre-university education, university admissions, university education, employment, expectations, and self-identified race. Photos of those students who participated in face-to-face interviews and admissions/academic records of all students were also obtained by the authors.

Data collection was as follows. UnB provided the authors a database with the names and contact information of students in the population of interest. Interviews were completed between May 2007 and August 2008 beginning with the oldest cohort (2-2003) and ending with the youngest (2-2005). An initial invitation to participate in the face-to-face interview was done by e-mail and a secondary invitation done by phone. We attempted to contact all students in the population of interest by e-mail, but due to resource constraints, we were only able to attempt to contact a random subset of students by phone. Face-to-face interviews took place in the UnB Department of Economics. With consent, a photo was taken of the respondent's student identification card, which had a standard photo taken upon matriculation. An invitation to participate in the online interview was sent by e-mail to those who had not yet responded to our

initial invitation. To minimize the salience of race and affirmative action in the recruitment process, the title of the survey was general ("University Education Survey"), and neither race nor affirmative action was raised in any contacts with potential respondents. 2,286 students in the population of interest completed the PSEU, which amounts to a participation rate of almost 40 percent. 799 face-to-face interviews were conducted, and 748 of these had viable photos. Some photos were taken but were too blurry to be useful, and others were not taken because the camera was temporarily out of batteries. About 9 percent of the e-mail addresses provided by the university were invalid (misspelled or deactivated), and about 25 percent of the phone numbers were incorrect.

Appendix Table A, which the reader can find on the corresponding author's website, investigates the representativeness of the PSEU. Given that we have comprehensive admissions and academic records, we are able to compare the sample and population with respect to a number of dimensions (gender, place of family residence, quota participation, semester of matriculation, subject of study, number of application attempts, vestibular score, college GPA, and QSC completion). The table suggests that there are only a small number of significant differences between the PSEU and population, and that such differences are modest. For example, the difference in GPA, albeit significant, is about 13 percent of one standard deviation of GPA. At 48.3 percent, the sample is more female than the population. But this appears to be a common feature of many surveys, for example, the General Social Survey. It turns out that the difference in social science is entirely explained by the overrepresentation of economics students in the sample, which undoubtedly arises from the fact that the interviews took place in the economics department. In any case, it may be helpful to mitigate potential bias through weighting. To do so, we run a probit regression of sample participation on the set of

characteristics in Appendix Table A and construct sample weights equivalent to the inverse of the predicted probability of participation.

B. Applicant Sample (QSC)

UnB provided the authors with a survey of applicants who took the vestibular exam between 2004 and 2005, a period including one admissions cycle before quotas (1-2004) and three after quotas (2-2004, 1-2005, and 2-2005). We refer to this survey by its Portuguese acronym QSC. Applicants submitted the 18-question QSC upon registration for the vestibular, that is, prior to taking the exam. It asked about self-identified race, socioeconomic status, and vestibular preparation. 1-2004 was the first admissions cycle that included questions on racial identity. However, note that the QSC was not the formal document with which applicants identified themselves as negro to apply under racial quotas. 24,252 applicants in the population of interest completed the QSC, which amounts to a participation rate of about 50 percent. An important caveat is that response rates were falling during the period from roughly 84 percent in 2-2003 to 36 percent in 2-2005. Appendix Table A suggests that there are many significant differences between the QSC and population. Given these substantial biases, it is vital to use sample weights.

C. Empirical Strategy

In what follows, we estimate the effect of racial quotas on pre-university effort, college academic performance, and black identity. To do so, we employ a difference-in-difference model interpreting the policy as a treatment on individuals with brown or dark skin tone. The following equation is estimated:

$$(1) Y = \tau^{pardo} * (I^{post-quotas} * R^{pardo}) + \tau^{preto} * (I^{post-quotas} * R^{preto}) + \sum_r \delta^r * R^r + \sum_t \beta^t * T^t + \gamma \cdot X + \varepsilon,$$

where Y is an outcome of interest, I is an indicator for application/matriculation post-quotas, R is an indicator for self-reported race/skin tone (pardo, preto, Asian, Indigenous), T is an indicator for semester of application/matriculation, and X is a vector of controls for socioeconomic status, gender, and subject of study. Thus, the effect of racial quotas on pardos is τ^{pardo} , and the effect of racial quotas on pretos is τ^{preto} .

Making use of photos taken in the face-to-face interviews, we asked a panel of Brazilian reviewers to rate the skin tone of the subject in each photo from one (light) to seven (dark). Scores were standardized by reviewer, standardized scores were averaged by photo, and average standardized scores were sorted into quintiles. In the tables and text, “lightest quintile” indicates the lowest 20 percent of average standardized scores, “second quintile” indicates the next 20 percent, and so on. Appendix Table 1 provides the distribution of self-reported race by skin tone quintile. The following equation is estimated:

$$(2) Y = \sum_q \tau^q * (I^{post-quotas} * Q^q) + \sum_q \delta^q * Q^q + \sum_t \beta^t * T^t + \gamma \cdot X + \varepsilon,$$

where Y is an outcome of interest, I is an indicator for application/matriculation post-quotas, Q is an indicator for skin tone quintile, T is an indicator for semester of application/matriculation, and X is a vector of controls for socioeconomic status, gender, and subject of study. Thus, the effect of racial quotas on skin tone quintile q is τ^q .

V. Results and Discussion

A. Effects on the Student Profile

The principal objective of the policy was to raise the proportion of black and socioeconomically disadvantaged students at UnB. Based on the PSEU, Table 4 compares the racial composition of students before and after quotas. The percentage of students who self-identified as negro, or black, increased from 15.3 percent pre-quotas to 20.6 percent post-quotas. While the percentage of students who self-reported as preto (dark-skinned) increased from 5.6 percent to 9.0 percent, the percentage who self-reported as pardo (brown-skinned), branco (light-skinned), Asian, and indigenous remained roughly constant. Although Table 4 suggests that racial quotas raised the proportion of negros, using self-reported race might be problematic. Figure 1 depicts histograms of average standardized skin tone based on ratings of student photos by a panel of Brazilian reviewers. Light skin tone is toward the left and dark skin tone toward the right. From pre- to post-quotas, the distribution of skin tone shifts to the right, which illustrates that students matriculating in the post-quota period had darker skin tone than students matriculating in the pre-quota period.

However, the question remains whether racial quotas also raised the proportion of socioeconomically disadvantaged students. Using the QSC, Table 5 compares applicants who were admitted but would not have been if the quota system had not existed (displacing) with those who were not admitted but would have been if the quota system had not existed (displaced). To identify the two groups, it was assumed that the counterfactual removal of the quota system would not have affected who applied or performance on the vestibular, and that the number of applicants admitted, by semester and department, would have remained identical.⁵ About 95 percent of the displacing identified as negro compared to 16 percent of the displaced.⁶ 71 percent and 27 percent of the displacing were pardo and preto, respectively, while about 31 percent and 2 percent of the displaced were. Furthermore, we find that displacing applicants

were, by many measures, from families with significantly lower socioeconomic status. For instance, 34.5 percent of the displacing and 57.7 percent of the displaced had a mother with a college degree. 59.5 percent of displacing and 34.0 percent of displaced applicants had family residence in Distrito Federal outside of Brasilia, which is meaningful because the average household income of families living in Distrito Federal outside of Brasilia was considerably lower than that of families living in Brasilia (PDAD 2004). Differences in self-reported family income and public secondary school attendance paint the same picture.^{7,8}

B. Effects on Pre-University Effort

Examining both applicants and students, we estimate the effect of racial quotas on effort in university admissions. A race-based affirmative action program may theoretically have two kinds of effects on effort (Fryer and Loury 2005a; Fryer, Loury, and Yuret 2008; Holzer and Neumark 2000). On one hand, affirmative action may increase the marginal return to actions that raise the likelihood of college admission. Changes in admissions standards might relocate some individuals who otherwise would have had little chance of selection to the margin of selection, thereby inspiring effort. On the other hand, affirmative action may decrease the marginal return to actions that raise the likelihood of admission. Changes in admissions standards might relocate some individuals who otherwise would have been at the margin of selection to an intra-marginal position, thus reducing effort. Hence, although racial quotas have an unambiguous effect on the conditional chances of admission, they have an ambiguous effect on returns to effort. Applying this logic to Brazil, it is important to remember that the margin of selection is actually multi-dimensional, as there exists a hierarchy of departments with vastly different minimum scores for

selection. To the extent that the objective is to gain admission to the most selective department possible, few applicants are intra-marginal.

To begin, we consider two measures of effort: the number of times that an applicant took the UnB vestibular and whether an applicant/student took a cursinho, a six- to twelve-month course offered by a private company to prepare for the UnB vestibular. While both variables are actions informative about returns to effort, they are imperfect, and it is not obvious what ideal measures one could obtain in practice. Table 6 displays the regressions. As columns (A) and (B) indicate, for each of the measures of effort, the coefficient on pardo applicant in the post-quota period is positive and significant, whereas the coefficient on preto applicant in the post-quota period is not significant. This may suggest that racial quotas increased the number of times that a self-reported pardo applicant took the vestibular by about 0.24 and increased the likelihood that a pardo applicant took a cursinho by about 5.8 percentage points. Alternatively, this may suggest that racial quotas tended to attract pardo applicants who were more likely to take the vestibular multiple times and more likely to take a cursinho. Comparing the profile of UnB applicants pre- and post-quotas may help to investigate the issue of selection into the applicant pool. Appendix Table B, which the reader can find on the author's website, indicates that post-quotas the applicant pool became more pardo, slightly less female, and slightly more socioeconomically advantaged. For this reason, we control for these factors in the regressions. Note that these factors do not appear to explain the results, that is, the pool is less female and more socioeconomically advantaged, but female and public secondary school are positively associated with cursinho. Nevertheless, it is still possible that we are not adequately accounting for changes in the applicant pool.

We also estimate the effect of quotas on the likelihood that students took a cursinho to prepare for the UnB vestibular. In column (C), neither the coefficient on pardo student in the post-quota period nor that on preto student in the post-quota period is significant, so even if there may be an effect on pardo applicants, there may not be an effect on pardo students. However, in column (D), the coefficient on the lightest quintile in the post-quota period is positive and significant, which may mean that students with the lightest skin tone were more likely to take a cursinho following the introduction of racial quotas.

Given that the margin of selection is multi-dimensional, it remains to establish whether the adoption of quotas in admissions inspired applicants/students with relatively dark skin tone to apply to more selective departments. Evidence on choice of department would yield insight regarding returns to effort. Based on complete admissions data from 2-2004, UnB departments were assigned values according to their rank by minimum score for selection; the most selective departments were assigned the highest values and the least selective the lowest values. Using this measure, the regressions in columns (E) and (F) demonstrate that for applicants and students, preto in the post-quota period is positive and significantly related to selectivity of department, while preto is negative and significantly related. Thus, although self-reported preto applicants/students tended to apply to less selective departments than brancos, the racial gap in selectivity decreased with the implementation of racial quotas. This may suggest that pretos are better characterized as marginal than intra-marginal, indicating that it is unlikely that returns to effort had diminished with the introduction of quotas. Column (G), which makes use of photo ratings, confirms that selectivity of department varied significantly with skin tone but does not confirm that the policy narrowed the gap in selectivity, as the coefficient on darkest quintile in the post-quota period is positive but insignificant. Taken together, the findings in the table imply

that racial quotas had not reduced the pre-university effort of applicants or students. Some evidence, albeit tenuous, may signify that the policy raised effort.

C. Effects on Racial Gaps in College Academic Performance

Focusing on UnB students, we examine the effect of quotas on racial gaps in college GPA. Racial disparities in college academic performance reflect a myriad of historical, social, and behavioral factors. The adoption of racial quotas might impact such disparities by modifying behaviors and/or the composition of students enrolled. Regardless of the underlying mechanisms, changes in racial gaps in GPA measure the extent to which the policy ameliorates or exacerbates college "mismatch." Table 7 displays the regressions. Grades range from zero (bad) to five (good); the mean and standard deviation of GPA are 3.82 and 0.65, respectively. The first three columns include students in all departments, and the last six columns include students in only the 50 percent most selective departments.

Columns (A) and (B) imply that the policy had no effect on racial gaps in GPA and also that there were few racial gaps in the first place. Only the coefficient on indigenous is significant. Restricting the sample to students in the 50 percent most selective departments uncovers additional findings. Column (D) reveals significant disparities, especially between brancos and pretos. The coefficients on pardo in the post-quota period and preto in the post-quota period are insignificant, so the policy did not appear to widen or narrow racial disparities among students in selective departments. Controlling for vestibular score in column (E), racial gaps in GPA slightly decrease in magnitude but remain significant indicating that they are not merely an artifact of differential performance on the vestibular. Nevertheless, columns (F) and (G) do not yield evidence for the existence of racial disparities; the puzzling coefficient on third quintile in the

post-quota period may perhaps be explained by changes in the composition of students and/or low sample size.

It is also fruitful to compare the academic performance of displacing and displaced students.⁹ As column (C) shows, the GPA of displaced students is lower than that of intra-marginal students but not significantly so, while the GPA of displacing students is significantly lower than that of displaced and intra-marginal students. Restricting the sample to students in the 50 percent most selective departments (column H) widens the gap in GPA between displacing students and everyone else. That difference is roughly the same as the difference between brancos and pretos in column (D). However, controlling for vestibular score in column (I), the coefficient on displacing students falls to the extent that it is no longer significantly different from the coefficient on displaced students.

In summary, there may have been modest racial disparities in GPA among students in selective departments, but the introduction of racial quotas did not seem to impact these in any way. Displacing students had somewhat lower GPAs than displaced and intra-marginal students, an outcome partially attributable to differential performance on the vestibular. Thus, the evidence is inconsistent with large "mismatch" effects with respect to college GPA (see Rothstein and Yoon, 2008). Factors independent of the policy, including racial differences arising prior to college attendance, appear to be driving any racial disparities in academic performance.

D. Effects on Racial Identity

At UnB, quotas are for negros. Given the competitiveness of admissions, there is substantial incentive to self-identify as black. Moreover, the university provides quota students with an array of programs that reinforce and foster investments in black identity, including a

space on campus to study, meet, and have activities. Therefore, the policy of racial quotas may have caused some students to consider themselves black thus placing them on a new life path, while it may have caused others to self-identify as black solely for the purpose of admissions. One of the main empirical challenges is to differentiate between actual change in black identity and racial misrepresentation. Actual change is enduring, substantial, and genuine, whereas misrepresentation is temporary, superficial, and opportunistic. Although we rely on both the QSC and PSEU to measure black identity, the PSEU better minimizes misrepresentation. PSEU respondents had little incentive to misrepresent themselves because they had already matriculated, understood that their responses were absolutely confidential, and were unaware of the research objectives.

We begin the analysis by using the QSC to estimate the effect of racial quotas on black identity. The first two columns of Table 8 involve the sample of applicants. The coefficients on both pardo and preto applicants in the post-quota period are positive and significant. This may suggest that racial quotas increased the likelihood that a pardo applicant self-identified as negro by about 25 percentage points and increased the likelihood that a preto applicant self-identified as negro by about 3 percentage points. Alternatively, this may suggest that racial quotas attracted pardo applicants who tended to consider themselves black. Appendix Table B, which the reader can find on the author's website, may help to shed light on the issue of selection into the applicant pool. The appendix table shows that post-quotas the applicant pool became more negro and more pardo, which certainly does not rule out the possibility that the rise in black identity was attributable to change in the applicant pool. More evidence is required to distinguish between the hypotheses.

The last six columns of Table 8 involve the sample of students who completed both the QSC and the PSEU. They responded to the same race questions at two points in time, first as an applicant and later as a student. In columns (C) and (D), the dependent variable is negro on the QSC. Here, the results mirror the results obtained with applicants. It appears that racial quotas increased the likelihood that pardo students self-identified as negro on the QSC by about 27 percentage points. In columns (E) to (H), the dependent variable is negro on the QSC and non-negro on the PSEU. If change in the applicant pool explained the increase in black identity on the QSC, we would expect consistency between the QSC and PSEU. However, the evidence indicates otherwise. The coefficient on pardo in the post-quota period is positive and significant, while the coefficient on fourth quintile in the post-quota period is positive, though insignificant. This may suggest that quotas raised, by about 15 percentage points, the likelihood that pardos self-identified as negro on the QSC but not on the PSEU. Hence, there was systematic inconsistency in black identity associated with the adoption of quotas. If results from students who responded to both surveys may provide insight more generally, they imply that part of the rise in black identity among pardos on the QSC was not a manifestation of change in the applicant pool but of racial misrepresentation.

Using students who completed both surveys, Table 9 further investigates the role of quotas in the evolution of responses between the QSC and PSEU. As the top panel shows, self-identified brancos and pretos exhibited consistency across surveys before and after the implementation of racial quotas. Most brancos reported that they were non-negro on both surveys, and most pretos reported that they were negro. Echoing the findings in Table 8, Table 9 illustrates that following the adoption of quotas pardos were significantly more likely to report that they were negro on the QSC but non-negro on the PSEU. 10.8 percent did so pre-quotas,

whereas 31.2 percent did so post-quotas. Moreover, switching responses in the other direction became less common. 12.8 percent of pardos pre-quotas and 5.8 percent post-quotas said that they were non-negro on the QSC but negro on the PSEU. Intriguingly, although the overall rate of consistency between surveys decreased for pardos, the percentage who reported that they were negro on both surveys increased from 11.1 percent to 24.1 percent.

As the bottom panel shows, for students with skin tone in the lightest three quintiles according to photo ratings, there were no significant changes in the pattern of responses between the QSC and PSEU pre- and post-quotas. In contrast, students in the fourth quintile demonstrated significant changes analogous to those demonstrated by pardos in the top panel. This makes sense given that Appendix Table 1 indicates 70 percent of students in the fourth quintile self-identified as pardo and 23 percent as branco. While the rate of consistency between surveys remained constant for students in the darkest quintile, an insignificantly greater share of respondents shifted toward reporting negro on the QSC but non-negro on the PSEU, and a significantly greater share of respondents shifted toward reporting negro on both surveys. Indeed, the percentage of students in the darkest quintile who reported they were negro on both surveys increased from 45.2 percent pre-quotas to 72.2 percent post-quotas. To summarize, Table 9 reveals evidence that points to a move toward racial misrepresentation among some pardos, especially those in the fourth quintile, but also points to a move toward consistent black identity among other pardos, especially those in the darkest quintile. In what follows, we explore genuine change in identity using the entire sample of students, not just the sub-sample of students who completed both surveys.

That the policy of racial quotas induced racial misrepresentation among some individuals by no means precludes the possibility that it also inspired genuine change in black identity

among others. Using the PSEU, which minimizes misrepresentation, Table 10 compares black identity by race/skin tone and photo ratings pre- and post-quotas. Both before and after quotas, almost all pretos and almost no brancos self-identified as negro. However, the percentage of pardos who self-identified as negro increased significantly with the implementation of racial quotas from approximately 18.8 percent to 24.4 percent. Photo ratings are also informative. Notably, there was no significant change in black identity for students with skin tone in the fourth quintile, the group most likely to switch from negro to non-negro between the QSC and PSEU. About 20.5 percent self-identified as negro pre-quotas and 19.8 percent post-quotas. In contrast, black identity increased from 57.1 percent to 77.1 percent for students with skin tone in the darkest quintile.

Table 11 explores the effect of racial quotas on black identity with the PSEU and difference-in-difference models. As the table shows, the coefficients on 2-2003 and 1-2004 are not significant in any of the specifications indicating that there was no trend in black identity prior to the implementation of quotas. In columns (A) and (B), the coefficient on pardo in the post-quota period is positive and significant, which may suggest that racial quotas increased the likelihood that a pardo student self-identified as negro by 6 percentage points. In columns (C) and (D), the coefficient on darkest quintile in the post-quota period is positive and significant. This may suggest that racial quotas increased black identity by roughly 20 percentage points among students with skin tone in the darkest quintile. To elucidate the findings, it is important to understand that of students with skin tone in the darkest quintile, about 47 percent self-identified as pardo and 48 percent as preto (see Appendix Table 1). Therefore, the table may provide evidence of change in black identity among dark-skinned students. These results are consistent with the incentives created by the policy. Indeed, the incentive to apply under the quota system

was substantial given the competitiveness of admissions, and programs for quota students reinforced and fostered investments in black identity. In this way, the policy may have placed some students on a new life path, the initial steps in the dynamic construction of black identity. These results are also consistent with the literature on the determinants of racial identity in economics, sociology, and other social sciences (Darity, Mason, and Stewart 2006; Golash-Boza and Darity 2008; Harris and Sim 2002; Kibria 1997; Lee and Bean 2004; Nagel 1994).

VI. Conclusion

In this paper, we have analyzed a policy that was part of the first-wave of affirmative action programs in Brazil. We find that racial quotas raised the proportion of black and dark-skinned students, and that displacing applicants were from lower socioeconomic status families. The evidence suggests that racial quotas did not reduce the pre-university effort of either applicants or students. Additionally, there may have been modest racial disparities in college academic performance among students in selective departments, though the policy did not seem to impact these in any way. The findings also suggest that racial quotas induced some individuals to misrepresent their racial identity but inspired other individuals, especially the darkest-skinned, to genuinely consider themselves black.

The findings contribute to the literature on affirmative action, race, and identity, and they raise a number of interesting questions. If racial quotas in higher education impact racial identity in the short-term, what are the long-term consequences? What are the implications for the marriage market and subsequent patterns of inequality? Future work may be able to address these and other issues. The findings may also help to improve existing policies and craft new ones. Assigning preference in admissions to individuals with the darkest skin tone or to individuals

with low socioeconomic status might prove effective in enhancing racial diversity and reducing inequality. Even so, considering the selectivity of college admissions and the innumerable factors determining performance on the entrance exam, any policy solely at the university level is likely to have only a limited societal impact. It may be necessary to do more.

References

- Abdulkadiroglu, Atila. 2005. "College Admissions with Affirmative Action." *International Journal of Game Theory* 33(4): 535-549.
- Akerlof, George A., and Rachel E. Kranton. 2000. "Economics and Identity." *Quarterly Journal of Economics* 115(3): 715-753.
- _____. 2002. "Identity and Schooling: Some Lessons for the Economics of Education." *Journal of Economic Literature* 40(4): 1167-1201.
- Arcidiacono, Peter. 2005. "Affirmative Action in Higher Education: How Do Admission and Financial Aid Rules Affect Future Earnings?" *Econometrica* 73(5): 1477-1524.
- Austen-Smith, David, and Roland G. Fryer, Jr. 2005. "An Economic Analysis of Acting White." *Quarterly Journal of Economics* 120(2): 551-583.
- Bertrand, Marianne, Rema Hanna, and Sendhil Mullainathan. 2010. "Affirmative Action in Education: Evidence from Engineering College Admissions in India." *Journal of Public Economics* 94(1-2): 16-29.
- Bodenhorn, Howard. 2006. "Colorism, Complexion Homogamy, and Household Wealth: Some Historical Evidence." *American Economic Review* 96(2): 256-260.
- Bucks, Brian. 2004. "Affirmative Access versus Affirmative Action: How Have Texas' Race-Blind Policies Affected College Outcomes?" Working Paper, Texas Schools Project.
- Card, David, and Alan B. Krueger. 2005. "Would the Elimination of Affirmative Action Affect Highly Qualified Minority Applicants? Evidence from California and Texas." *Industrial and Labor Relations Review* 58(3): 416-434.

- Cardoso, Claudete Batista. 2008. "Efeitos da Política de Cotas na Universidade de Brasília: Uma Análise do Rendimento e da Evasão." Masters Thesis, Department of Education, University of Brasilia.
- Chan, Jimmy, and Erik Eyster. 2003. "Does Banning Affirmative Action Lower College Student Quality?" *American Economic Review* 93(3): 858-872.
- Coate, Stephen, and Glenn C. Loury. 1993. "Will Affirmative-Action Policies Eliminate Negative Stereotypes?" *American Economic Review* 83(5): 1220-1240.
- Conrad, Cecilia A., and Rhonda V. Sharpe. 1996. "The Impact of the California Civil Rights Initiative (CCRI) on University and Professional School Admissions and the Implications for the California Economy." *Review of Black Political Economy* 25(1): 13-59.
- Darity, William A., Jr., Jason Dietrich, and Darrick Hamilton. 2005. "Bleach in the Rainbow: Latin Ethnicity and Preference for Whiteness." *Transforming Anthropology* 13(2): 103-109.
- Darity, William A., Jr., Patrick L. Mason, James B. Stewart. 2006. "The Economics of Identity: The Origin and Persistence of Racial Identity Norms." *Journal of Economic Behavior and Organization* 60(3): 283-305.
- De Fraja, Gianni. 2005. "Reverse Discrimination and Efficiency in Education." *International Economic Review* 46(3): 1009-1031.
- Desai, Sonalde, and Veena Kulkarni. 2008. "Changing Educational Inequalities in India in the Context of Affirmative Action." *Demography* 45(2): 245-270.
- Dickson, Lisa M. 2006. "Does Ending Affirmative Action in College Admissions Lower the Percent of Minority Students Applying to College?" *Economics of Education Review* 25(1): 109-119.

- Donohue, John J., III, and James Heckman. 1991. "Continuous versus Episodic Change: The Impact of Civil Rights Policy on the Economic Status of Blacks." *Journal of Economic Literature* 29(4): 1603-1643.
- Eltis, David. 2001. "The Volume and Structure of the Transatlantic Slave Trade: A Reassessment." *The William and Mary Quarterly* 58(1): 17-46.
- Epple, Dennis, Richard Romano, and Holger Sieg. 2008. "Diversity and Affirmative Action in Higher Education." *Journal of Public Economic Theory* 10(4): 475-501.
- Ferman, Bruno, and Juliano Assunção. 2005. "Affirmative Action in University Admissions and High School Students' Proficiency." Working Paper, Department of Economics, PUC-Rio.
- Francis, Andrew M. 2008. "The Economics of Sexuality: The Effect of HIV/AIDS on Homosexual Behavior in the United States." *Journal of Health Economics* 27(3): 675-689.
- Francis, Andrew M., and Maria Tannuri-Pianto. 2012. "The Redistributive Equity of Affirmative Action: Exploring the Role of Race, Socioeconomic Status, and Gender in College Admissions." *Economics of Education Review* 31(1): 45-55.
- Fryer, Roland G., Jr., and Glenn C. Loury. 2005a. "Affirmative Action and Its Mythology." *Journal of Economic Perspectives* 19(3): 147-162.
- _____. 2005b. "Affirmative Action in Winner-Take-All Markets." *Journal of Economic Inequality* 3(3): 263-280.
- Fryer, Roland G., Jr., Glenn C. Loury, and Tolga Yuret. 2008. "An Economic Analysis of Color-Blind Affirmative Action." *Journal of Law, Economics, and Organization* 24(2): 319-355.
- Fryer, Roland G., Jr., Lisa Kahn, Steven D. Levitt, and Jorg L. Spenkuch. 2008. "The Plight of Mixed Race Adolescents." NBER Working Paper number 14192.

- Golash-Boza, Tanya, and William Darity, Jr. 2008. "Latino Racial Choices: The Effects of Skin Colour and Discrimination on Latinos' and Latinas' Racial Self-identifications." *Ethnic and Racial Studies* 31(5): 899-934.
- Goldsmith, Arthur H., Darrick Hamilton, and William Darity, Jr. 2006. "Shades of Discrimination: Skin Tone and Wages." *American Economic Review* 96(2): 242-245.
- _____. 2007. "From Dark to Light: Skin Color and Wages among African-Americans." *Journal of Human Resources* 42(4): 701-738.
- Harris, David R., and Jeremiah Joseph Sim. 2002. "Who is multiracial? Assessing the complexity of lived race." *American Sociological Review* 67(4): 614-627.
- Hersch, Joni. 2006. "Skin-Tone Effects among African Americans: Perceptions and Reality." *American Economic Review* 96(2): 251-255.
- Holzer, Harry, and David Neumark. 2000. "Assessing Affirmative Action." *Journal of Economic Literature* 38(3): 483-568.
- IBGE (Instituto Brasileiro de Geografia e Estatística). 2010. "Pesquisa Nacional por Amostra de Domicílios: Síntese de Indicadores 2009." Online Report, Instituto Brasileiro de Geografia e Estatística, Brasília.
- Kain, John F., Dan O'Brien, and Paul Jargowsky. 2005. "Hopwood and the Top 10 Percent Law: How They Have Affected the College Enrollment Decisions of Texas High School Graduates." Working Paper, Texas Schools Project.
- Kibria, Nazli. 1997. "The Construction of 'Asian American': Reflections on Intermarriage and Ethnic Identity among Second-Generation Chinese and Korean Americans." *Ethnic and Racial Studies* 20(3): 523-544.

- Lee, Jennifer, and Frank D. Bean. 2004. "America's Changing Color Lines: Immigration, Race/Ethnicity, and Multiracial Identification." *Annual Review of Sociology* 30(2004): 221-242.
- Leonard, Jonathan S. 1984a. "Antidiscrimination or Reverse Discrimination: The Impact of Changing Demographics, Title VII, and Affirmative Action on Productivity." *Journal of Human Resources* 19(2): 145-174.
- _____. 1984b. "Employment and Occupational Advance under Affirmative Action." *Review of Economics and Statistics* 66(3): 377-385.
- _____. 1984c. "The Impact of Affirmative Action on Employment." *Journal of Labor Economics* 2(4): 439-463.
- Long, Mark C. 2004a. "College Applications and the Effect of Affirmative Action." *Journal of Econometrics* 121(1-2): 319-342.
- _____. 2004b. "Race and College Admissions: An Alternative to Affirmative Action?" *Review of Economics and Statistics* 86(4): 1020-1033.
- Loury, Linda Datcher, and David Garman. 1993. "Affirmative Action in Higher Education." *American Economic Review* 83(2): 99-103.
- Lovell, Peggy A., and Charles H. Wood. 1998. "Skin Color, Racial Identity, and Life Chances in Brazil." *Latin American Perspectives* 25(3): 90-109.
- Nagel, Joane. 1994. "Constructing Ethnicity - Creating and Recreating Ethnic Identity and Culture." *Social Problems* 41(1): 152-176.
- PDAD (Pesquisa Distrital por Amostra de Domicílios). 2004. "PDAD Technical Report." SEPLAN/CODEPLAN (Companhia de Desenvolvimento do Planalto Central), Brasília.

- PNAD (Pesquisa Nacional por Amostra de Domicílios). 2004. Dataset, Instituto Brasileiro de Geografia e Estatística, Brasília.
- Rangel, Marcos. 2007. "Is Parental Love Colorblind? Allocation of Resources within Mixed Families." Working Paper 0714, Harris School of Public Policy Studies, University of Chicago.
- Rothstein, Jesse, and Albert H. Yoon. 2008. "Affirmative Action in Law School Admissions: What Do Racial Preferences Do?" NBER Working Paper number 14276.
- Ruebeck, Christopher S., Susan L. Averett, and Howard N. Bodenhorn. 2009. "Acting White or Acting Black: Mixed-Race Adolescents' Identity and Behavior." *B.E. Journal of Economic Analysis and Policy: Contributions to Economic Analysis and Policy* 9(1): 1-42.
- Smith, James P., and Finis Welch. 1984. "Affirmative Action and Labor Markets" *Journal of Labor Economics* 2(2): 269-301.
- Telles, Edward. 2004. *Race in Another America: The Significance of Skin Color in Brazil*. Princeton: Princeton University Press.
- Theodoro, Mário, Luciana Jaccoud, Rafael Osório, and Sergei Soares. 2008. *As políticas públicas e a desigualdade racial no Brasil: 120 anos após a abolição*. Brasília: Ipea.
- Tienda, Marta, Sigal Alon, and Sunny X. Niu. 2008. "Affirmative Action and the Texas Top 10% Admissions Law: Balancing Equity and Access to Higher Education" Working Paper, Princeton University Office of Population Research.
- Wood, Charles H., and Peggy A. Lovell. 1992. "Racial Inequality and Child Mortality in Brazil." *Social Forces* 70(3): 703-724.
- Zakabi, Rosana, and Leoleli Camargo. 2007. "Raça Não Existe." *Veja*, June 6, p. 82-88.

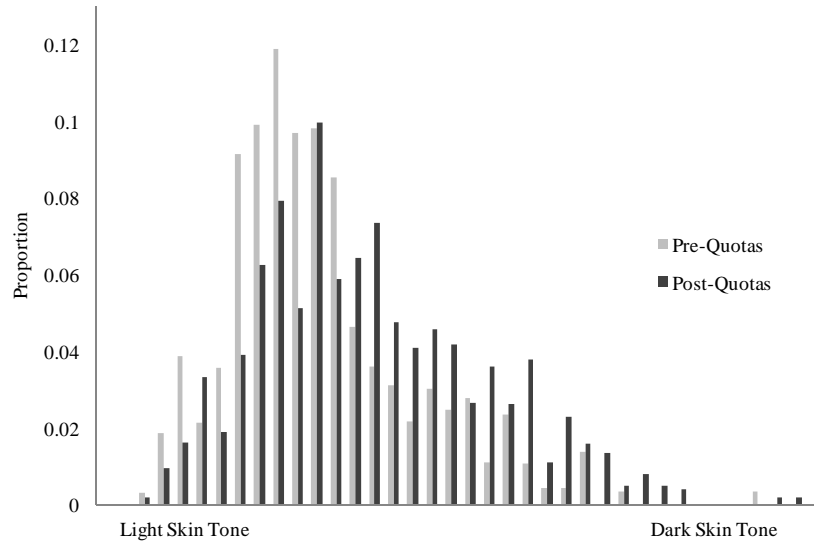


Figure 1

Distribution of Skin Tone

Source: PSEU.

Note: Histograms of average standardized skin tone are based on ratings of student photos. Light skin tone is toward the left and dark skin tone toward the right. Sample weights are used.

Table 1

Definition of Portuguese Racial Terms

Self-Reported Race ("What is your race/color?")		
Branco	Light-skinned	Note that although the three terms are colors, their social meaning encompasses more than skin tone.
Pardo	Brown-skinned	
Preto	Dark-skinned	

Self-Reported Black Identity ("Do you consider yourself negro?")		
Negro	Black/Afro-Brazilian identity	Most pretos and some pardos consider themselves negro, while most brancos and some pardos do not.

Note: The first question appears on surveys conducted by the authors, university, and Brazilian Statistical Agency (IBGE). It is Brazil's standard race question. The second appears on surveys conducted by the authors and university. Recall that quotas at UnB are for negros.

Table 2

Race and Socioeconomic Status (in percentages)

	Branços	Pardos	Pretos	Difference in Means
<i>Young Adults in Distrito Federal</i>				
Raised with both parents	50.6	45.9	42.2	*
Mother college education	23.4	9.5	1.1	** ** *
Family has computer	55.8	29.3	18.6	** ** *
Family has internet	47.6	20.9	12.8	** ** *
Family has freezer	62.7	40.5	35.3	** **
Family has washing machine	71.5	49.7	40.2	** ** *
Low family income (\leq R\$ 750)	22.3	38.9	37.4	** **
High family income ($>$ R\$ 5000)	27.2	10.0	6.1	** **
<i>N</i>	633	808	99	
<i>UnB Applicants</i>				
Mother college education	56.3	44.8	34.1	** ** *
Attended public secondary school	24.1	37.1	51.6	** ** *
Low family income (\leq R\$ 750)	7.5	14.6	23.7	** ** *
High family income ($>$ R\$ 5000)	32.2	18.5	13.7	** ** *
<i>N</i>	9,697	9,048	2,217	
<i>UnB Students</i>				
Raised with both parents	74.7	74.6	68.8	*
Mother college education	60.6	44.6	37.7	** ** *
Family has computer	93.1	88.2	85.4	** **
Family has internet	90.4	86.8	77.9	** ** *
Family has freezer	74.5	72.3	68.5	*
Family has washing machine	94.7	93.3	83.9	** **
No domestic workers at home	37.1	50.5	65.2	** ** *
Attended public secondary school	32.8	46.9	65.4	** ** *
<i>N</i>	1,047	971	192	

Sources: PNAD (top panel), QSC (middle), PSEU (bottom).

Note: A double asterisk indicates significant difference in proportions at the five percent level, and a single asterisk indicates significance at the ten percent level. The first column of asterisks

refers to the comparison of brancos and pardos, the second to brancos and pretos, and the third to pardos and pretos. The sample of 15-24 year olds is restricted to those living with their mothers.

Sample weights are used.

Table 3

Admissions by Department

Department	Non-quota admissions score (NQ)	Quota admissions score (Q)	# Non-quota applicants			# Quota applicants		
			Above NQ	Between NQ & Q	Below Q	Above NQ	Between NQ & Q	Below Q
Medicine	99.8	99.5	29	31	1876	4	3	212
Law	98.0	94.6	40	80	1566	5	5	412
Robotic Engineering	97.1	79.1	24	85	249	1	5	25
International Relations	95.4	91.7	32	33	711	3	5	47
Electrical Engineering	94.7	85.0	39	42	190	4	4	26
Engineering of Information	93.2	56.8	25	68	150	0	7	14
Computer Science	92.2	83.1	25	41	472	4	2	63
Biology	91.5	45.0	27	148	277	1	6	41
Social Communication	91.1	73.3	55	164	893	2	11	134
Dentistry	90.3	61.9	19	55	246	2	2	27
Mechanical Engineering	89.7	73.9	35	47	206	3	5	25
Political Science	87.9	82.5	35	25	281	5	3	59
Economics	87.8	76.4	37	40	217	0	8	36
Pharmaceutical Science	87.8	78.9	27	30	287	0	6	32
Architecture	85.1	54.8	26	82	154	0	6	13
Nutrition Science	84.7	42.3	23	103	335	1	4	50
Industrial Design	84.4	61.2	16	51	78	0	4	8
Psychology	83.9	68.7	30	53	496	2	5	83
Physics	83.7	45.4	24	63	85	1	6	12
Civil Engineering	81.5	11.9	41	151	91	0	4	8
Veterinary Medicine	81.4	57.1	25	63	362	2	4	32
History	79.7	56.2	24	47	247	0	6	72
Business	77.4	65.6	45	40	402	6	4	61

Nursing	74.8	74.8	22	0	456	6	0	142
Language Translation	72.5	28.3	24	99	116	1	4	24
Agronomy	71.7	38.9	36	80	321	0	8	57
Statistics	70.9	62.4	20	10	134	1	4	16
Social Sciences	68.8	58.2	52	31	292	6	6	83
Forest Engineering	68.3	53.3	34	28	250	0	8	48
Chemistry	68.1	10.5	33	83	72	3	3	16
Portuguese	65.8	56.9	22	5	146	3	3	40
Physical Education	64.6	46.9	33	35	644	3	5	180
Mathematics	62.6	11.6	33	73	72	2	5	24
Geography	62.4	61.3	28	0	245	4	2	79
Accounting	61.9	59.9	34	5	276	7	2	60
Philosophy	59.8	35.1	21	16	69	1	3	25
Geology	52.1	49.2	27	4	126	4	1	19
Social Work	48.2	47.5	24	0	246	5	1	68
Library Science	40.9	28.3	34	15	249	5	3	90
Fine Arts	40.3	26.5	24	12	103	5	1	13
Teaching	38.4	34.3	63	14	490	14	1	161
Performing Arts	12.9	12.9	15	0	24	1	0	6

Note: This table is based on complete admissions data from 2-2004. For individuals who applied under the general vestibular system, the non-quota admissions score (NQ) was the minimum score necessary for selection. For individuals who applied under the quota system, the quota admissions score (Q) was the minimum score necessary for selection. Departments are sorted by non-quota admission score. NQ and Q are displayed as percentile scores. Some departments are omitted due to space constraints.

Table 4

Race Before and After Quotas (in percentages)

	Pre-quotas		Post-quotas
<i>Black Identity</i>			
Negro	15.3	**	20.6
<i>Race/Skin Tone</i>			
Branco	47.8		44.8
Pardo	43.3		42.8
Preto	5.6	**	9.0
Asian	1.9		1.5
Indigenous	1.4		1.9
<i>N</i>	789		1,497

Source: PSEU.

Note: A double asterisk indicates significant difference in proportions at the five percent level, and a single asterisk indicates significance at the ten percent level. Sample weights are used.

Table 5

Comparing Displacing and Displaced Applicants (in percentages)

	Displacing		Displaced
Black identity (negro)	94.7	**	16.2
Race/skin tone			
Branco	0.3	**	44.8
Pardo	70.5	**	30.7
Preto	27.2	**	1.8
Asian	0.7	*	3.1
Indigenous	0.7		0.6
No answer	0.7	**	19.0
Female	44.5		40.5
Family residence			
Brasilia	32.3	**	52.1
Distrito Federal, not Brasilia	59.5	**	34.0
Outside of Distrito Federal	8.2	**	13.9
Family income			
Less than R\$ 500	9.2	**	3.7
R\$ 500-1,500	30.5	**	15.3
R\$ 1,500-2,500	18.0	*	11.0
R\$ 2,500-5,000	24.6		26.4
More than R\$ 5,000	8.5	**	30.7
Don't know	9.2		12.9
Mother's education			
Primary school incomplete	16.6	**	4.9
Primary school complete	9.1		4.9
Secondary school complete	38.8	*	30.7
College	34.5	**	57.7
Don't know	1.0		1.8
Public secondary school attendance	53.4	**	38.7

Source: QSC.

Note: A double asterisk indicates significant difference in proportions at the five percent level, and a single asterisk indicates significance at the ten percent level. From 2-2004 to 2-2005, the displacing were those applicants who were admitted but would not have been if the quota system

had not existed, while the displaced were those who were not admitted but would have been if the quota system had not existed. 352 displacing and 352 displaced applicants were identified. For most variables in the table, sample size is 466, since not all applicants completed the QSC; gender and family residence have no missing values.

Table 6

Pre-University Effort

Variable	Dependent Variable:						
	Vestibular Attempts	Cursinho			Selectivity of Department		
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
Pardo x post-quotas	0.240 (0.043) **	0.058 (0.016) **	-0.004 (0.038)		0.001 (0.488)	-0.278 (1.443)	
Preto x post-quotas	0.078 (0.071)	-0.003 (0.027)	-0.060 (0.071)		1.530 (0.828) *	4.852 (2.649) *	
Pardo	0.043 (0.036)	0.021 (0.014)	0.034 (0.032)		-1.306 (0.419) **	-1.322 (1.182)	
Preto	0.119 (0.059) **	0.054 (0.022) **	0.096 (0.062)		-2.755 (0.697) **	-8.207 (2.275) **	
Asian	-0.040 (0.053)	0.038 (0.019) *	0.037 (0.066)		-0.613 (0.554)	4.668 (2.995)	
Indigenous	0.114 (0.120)	0.133 (0.040) **	-0.022 (0.074)		-2.935 (1.192) **	-4.682 (3.038)	
Lightest quintile x post-quotas				0.160 (0.085) *			
Second quintile x post-quotas				0.075 (0.083)			
Third quintile x post-quotas							5.150 (3.290)
Fourth quintile x post-quotas				-0.077 (0.076)			4.604 (3.261)
Darkest quintile x post-quotas				-0.028			2.495

Lightest quintile				(0.090)			(3.381)
				-0.189			
				(0.065) **			
Second quintile				-0.176			
				(0.063) **			
Third quintile							-6.282
							(2.531) **
Fourth quintile				0.024			-5.994
				(0.056)			(2.722) **
Darkest quintile				-0.033			-7.741
				(0.076)			(2.883) **
2-2003			-0.038	0.075		-0.323	0.046
			(0.030)	(0.059)		(1.168)	(2.013)
1-2004	-0.078	-0.070	-0.103	-0.065	0.148	0.553	1.691
	(0.027) **	(0.010) **	(0.037) **	(0.065)	(0.300)	(1.333)	(2.442)
1-2005	0.125	-0.021	-0.089	-0.123	1.093	0.613	1.817
	(0.028) **	(0.010) **	(0.030) **	(0.052) **	(0.301) **	(1.138)	(1.948)
2-2005	-0.608	0.029	-0.038	-0.022	1.552	0.039	0.342
	(0.029) **	(0.010) **	(0.023) *	(0.038)	(0.300) **	(0.900)	(1.543)
Gender/socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject area controls	Yes	Yes	Yes	Yes	No	No	No
Applicant or student sample	App	App	Stu	Stu	App	Stu	Stu
<i>N</i>	24252	24189	2,244	729	24252	2,253	731

Sources: QSC (columns A-B, E), PSEU (columns C-D, F-G).

Note: Numbers in parentheses are robust standard errors. A double asterisk indicates significance at the five percent level, and a single asterisk indicates significance at the ten percent level. Skin tone quintiles are based on ratings of student photos. Controls include gender and measures of socioeconomic status. Sample weights are used in the regression models.

Table 7

College Academic Performance

Variable	Dependent Variable: College Grade Point Average (GPA)								
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	<i>For all departments</i>				<i>For 50 percent most selective departments</i>				
Pardo x post-quotas	-0.062 (0.060)			0.020 (0.080)	0.044 (0.079)				
Preto x post-quotas	0.012 (0.115)			0.140 (0.190)	0.204 (0.195)				
Pardo	-0.070 (0.047)			-0.136 (0.063)**	-0.131 (0.062)**				
Preto	-0.128 (0.100)			-0.338 (0.170)**	-0.300 (0.175)*				
Asian	0.000 (0.085)			-0.081 (0.113)	-0.120 (0.117)				
Indigenous	-0.362 (0.109)**			-0.299 (0.137)**	-0.249 (0.131)*				
Third quintile x post-quotas		0.091 (0.139)				0.316 (0.161)*	0.331 (0.152)**		
Fourth quintile x post-quotas		-0.102 (0.132)				0.076 (0.176)	0.130 (0.169)		
Darkest quintile x post-quotas		-0.031 (0.139)				0.160 (0.219)	0.260 (0.223)		
Third quintile		-0.164 (0.112)				-0.200 (0.133)	-0.194 (0.122)		
Fourth quintile		0.002				-0.088	-0.074		

		(0.106)				(0.137)	(0.130)		
Darkest quintile		-0.111				-0.228	-0.212		
		(0.121)				(0.182)	(0.190)		
Displacing students			-0.256					-0.330	-0.170
			(0.070)**					(0.087)**	(0.098)*
Displaced students			-0.083					-0.101	-0.059
			(0.065)					(0.084)	(0.083)
2-2003	0.002	0.120	0.020	0.054	0.035	0.135	0.096	0.022	0.007
	(0.051)	(0.081)	(0.040)	(0.064)	(0.062)	(0.111)	(0.109)	(0.055)	(0.054)
1-2004	0.002	0.227	0.023	0.039	0.002	0.364	0.328	0.012	-0.022
	(0.058)	(0.100)**	(0.050)	(0.077)	(0.075)	(0.141)**	(0.137)**	(0.070)	(0.067)
1-2005	-0.066	0.102	-0.062	-0.020	-0.019	0.100	0.061	-0.014	-0.014
	(0.055)	(0.072)	(0.055)	(0.070)	(0.069)	(0.100)	(0.097)	(0.068)	(0.069)
2-2005	-0.143	-0.000	-0.152	-0.087	-0.057	0.045	0.064	-0.102	-0.066
	(0.040)**	(0.063)	(0.041)**	(0.055)	(0.055)	(0.094)	(0.092)	(0.055)*	(0.056)
Vestibular score					0.169		0.193		0.153
					(0.028)**		(0.047)**		(0.031)**
Gender/socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject area controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Applicant or student sample	Stu	Stu	Stu	Stu	Stu	Stu	Stu	Stu	Stu
<i>N</i>	2,253	731	2,253	1,136	1,136	373	373	1,136	1,136

Source: PSEU.

Note: Numbers in parentheses are robust standard errors. A double asterisk indicates significance at the five percent level, and a single asterisk indicates significance at the ten percent level. Skin tone quintiles are based on ratings of student photos. Vestibular score is

standardized to have a mean of zero and standard deviation of one. Controls include gender and measures of socioeconomic status.

Sample weights are used in the regression models.

Table 8

Black Identity on QSC

Variable	Dependent Variable:							
	Negro on QSC			Negro on QSC and non-negro on PSEU				
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Pardo x post-quotas	0.246 (0.013)**	0.245 (0.013)**	0.267 (0.064)**		0.154 (0.053)**	0.150 (0.054)**		
Preto x post-quotas	0.025 (0.013)**	0.027 (0.013)**	-0.027 (0.042)		-0.001 (0.035)	0.010 (0.040)		
Pardo	0.257 (0.011)**	0.248 (0.011)**	0.149 (0.055)**		0.046 (0.044)	0.049 (0.045)		
Preto	0.915 (0.010)**	0.894 (0.010)**	0.886 (0.036)**		-0.062 (0.027)**	-0.053 (0.034)		
Asian	0.065 (0.010)**	0.058 (0.010)**	-0.079 (0.032)**		-0.073 (0.026)**	-0.083 (0.038)**		
Indigenous	0.376 (0.041)**	0.371 (0.041)**	0.247 (0.130)*		0.202 (0.127)	0.207 (0.127)		
Third quintile x post-quotas				0.006 (0.162)			-0.060 (0.141)	-0.093 (0.137)
Fourth quintile x post-quotas				0.399 (0.146)**			0.176 (0.123)	0.153 (0.128)
Darkest quintile x post-quotas				0.374 (0.181)**			0.090 (0.087)	0.080 (0.096)
Third quintile				0.068 (0.143)			0.090 (0.122)	0.121 (0.118)
Fourth quintile				-0.048 (0.126)			-0.029 (0.097)	0.004 (0.109)

Darkest quintile				0.305 (0.172) *			-0.099 (0.068)	-0.076 (0.086)
1-2004	0.076 (0.005) **	0.075 (0.005) **	0.055 (0.036)	0.093 (0.109)	0.060 (0.033) *	0.066 (0.034) **	0.066 (0.078)	0.074 (0.082)
1-2005	0.088 (0.006) **	0.092 (0.006) **	0.182 (0.038) **	0.202 (0.064) **	0.182 (0.036) **	0.180 (0.036) **	0.243 (0.066) **	0.243 (0.069) **
2-2005	0.090 (0.007) **	0.095 (0.007) **	0.192 (0.035) **	0.238 (0.067) **	0.213 (0.033) **	0.209 (0.033) **	0.295 (0.062) **	0.310 (0.061) **
Gender/socioeconomic controls	No	Yes	Yes	Yes	No	Yes	No	Yes
Subject area controls	No	Yes	Yes	Yes	No	Yes	No	Yes
Applicant or student sample	App	App	Stu	Stu	Stu	Stu	Stu	Stu
<i>N</i>	23971	23971	951	324	965	951	331	324

Sources: QSC (columns A-H), PSEU (columns C-H).

Note: Numbers in parentheses are robust standard errors. A double asterisk indicates significance at the five percent level, and a single asterisk indicates significance at the ten percent level. Student sample consists of those who completed both the QSC and PSEU. Skin tone quintiles are based on ratings of student photos. Controls include gender and measures of socioeconomic status. Sample weights are used in the regression models.

Table 9

Difference in Black Identity between QSC and PSEU (in percentages)

Negro		Branços		Pardos		Pretos		
		Pre-quotas	Post-quotas	Pre-quotas	Post-quotas	Pre-quotas	Post-quotas	
QSC	PSEU							
No	No	92.9	86.6	65.2	**	38.9	0.0	0.7
No	Yes	0.0	1.1	12.8	**	5.8	0.0	2.6
Yes	No	7.1	11.4	10.8	**	31.2	0.0	1.6
Yes	Yes	0.0	0.9	11.1	**	24.1	100.0	95.1

Negro		Lightest three quintiles		Fourth quintile		Darkest quintile			
		Pre-quotas	Post-quotas	Pre-quotas	Post-quotas	Pre-quotas	Post-quotas		
QSC	PSEU								
No	No	80.0	69.9	73.9	**	38.3	36.9	**	10.7
No	Yes	2.6	5.3	19.1	**	2.8	17.8	*	4.8
Yes	No	13.9	19.1	7.0	**	37.3	0.0		12.4
Yes	Yes	3.5	5.7	0.0	*	21.5	45.2	*	72.2

Sources: QSC, PSEU.

Note: A double asterisk indicates significant difference in proportions at the five percent level, and a single asterisk indicates significance at the ten percent level. Skin tone quintiles are based on ratings of student photos. The sample consists of students who completed both the QSC and PSEU. Sample weights are used.

Table 10

Black Identity on PSEU (in percentages)

	Branços		Pardos		Pretos	
	Pre-quotas	Post-quotas	Pre-quotas	Post-quotas	Pre-quotas	Post-quotas
<u>Negro</u>						
Yes	2.2	2.0	18.8	** 24.4	100.0	98.2
No	97.8	98.0	81.2	** 75.6	0.0	1.8
	Lightest three quintiles		Fourth quintile		Darkest quintile	
	Pre-quotas	Post-quotas	Pre-quotas	Post-quotas	Pre-quotas	Post-quotas
<u>Negro</u>						
Yes	10.9	8.0	20.5	19.8	57.1	** 77.1
No	89.1	92.1	79.5	80.2	42.9	** 22.9

Source: PSEU.

Note: A double asterisk indicates significant difference in proportions at the five percent level, and a single asterisk indicates significance at the ten percent level. Skin tone quintiles are based on ratings of student photos. Sample weights are used.

Table 11

Black Identity on PSEU

Variable	Dependent Variable: Negro			
	(A)	(B)	(C)	(D)
Pardo x post-quotas	0.061 (0.030)**	0.060 (0.030)**		
Preto x post-quotas	-0.016 (0.016)	-0.021 (0.019)		
Pardo	0.164 (0.024)**	0.144 (0.023)**		
Preto	0.974 (0.009)**	0.941 (0.015)**		
Asian	-0.021 (0.005)**	-0.027 (0.011)**		
Indigenous	0.255 (0.073)**	0.207 (0.073)**		
Third quintile x post-quotas			-0.079 (0.072)	-0.091 (0.073)
Fourth quintile x post-quotas			-0.002 (0.086)	-0.025 (0.086)
Darkest quintile x post-quotas			0.189 (0.107) *	0.208 (0.106)**
Third quintile			0.114 (0.062) *	0.105 (0.065)
Fourth quintile			0.141 (0.075) *	0.152 (0.076)**
Darkest quintile			0.506 (0.097)**	0.458 (0.097)**
2-2003	-0.006 (0.018)	-0.012 (0.018)	-0.021 (0.042)	-0.022 (0.041)
1-2004	-0.014 (0.020)	-0.017 (0.020)	-0.085 (0.053)	-0.055 (0.053)
1-2005	-0.013 (0.022)	-0.018 (0.022)	-0.058 (0.047)	-0.041 (0.046)
2-2005	-0.029 (0.018)	-0.033 (0.018) *	-0.090 (0.035)**	-0.092 (0.034)**
Gender/socioeconomic controls	No	Yes	No	Yes
Subject area controls	No	Yes	No	Yes
Applicant or student sample	Stu	Stu	Stu	Stu

<i>N</i>	2,281	2,248	746	729
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Source: PSEU.

Note: Numbers in parentheses are robust standard errors. A double asterisk indicates significance at the five percent level, and a single asterisk indicates significance at the ten percent level. Skin tone quintiles are based on ratings of student photos. Controls include gender and measures of socioeconomic status. Sample weights are used in the regression models.

Appendix Table 1

Distribution of Self-Reported Race by Skin Tone Quintile (in percentages)

		Skin tone quintiles (photos)				
		Lightest Quintile	Second Quintile	Third Quintile	Fourth Quintile	Darkest Quintile
Race/skin tone (self-reported)	Branco	81.8	61.3	39.0	22.6	2.6
	Pardo	17.2	33.1	52.9	70.1	47.1
	Preto	0.0	0.6	2.1	3.7	47.8
	Asian	0.0	2.9	3.8	2.3	0.0
	Indigenous	0.9	2.2	2.1	1.4	2.4

Source: PSEU.

Note: Quintiles of average standardized skin tone are based on ratings of student photos. Sample size is 748. Sample weights are used.

¹ The terms "branco" (light-skinned), "pardo" (brown-skinned), and "preto" (dark-skinned) are answer choices to the standard race question utilized by the Brazilian Statistical Agency. This question also appears on surveys conducted by the authors and university. Although the terms are colors, their social meaning encompasses more than skin tone.

² The term "negro" is a descriptor of black/Afro-Brazilian identity. This question appears on surveys conducted by the authors and university. There is considerable debate in Brazil about the meaning of negro. To some, negro is equivalent to preto. To others, all who self-identify as pardo or preto are negro. In this study, we do not place any restrictions on the relationship between negro and branco/pardo/preto, since respondents are asked separate questions. According to our data, most pretos and some pardos consider themselves negro, while most brancos and some pardos do not.

³ Initially, the university panel judged photographs of students. Interviews replaced photographs after a national magazine exposed the case of two identical twins, Alan and Alex, one of whom was considered black by the panel and the other of whom was considered non-black (Zakabi and Camargo 2007).

⁴ Note that a few departments had more than 20 percent negro students in the pre-quota period, but these were among the least selective departments, for example, music, art, and literature.

⁵ For each of the three admissions cycles following the implementation of quotas, all applicants were ranked by department and vestibular score; applicants admitted counterfactually (if the quota system had not existed) were those with the top n scores in each department, where n represents the number of departmental admissions slots; those applicants admitted counterfactually but not actually were designated as displaced, and those admitted actually but

not counterfactually were designated as displacing. In this way, 352 displaced and 352 displacing applicants were identified based on comprehensive admissions records.

⁶ Nearly all who applied for quotas were black, but not all blacks chose to apply for quotas. About 5 percent of displacing applicants reported they did not consider themselves negro. They may have made a mistake on the QSC, or they may have misrepresented their racial identity when applying under the quota system. It is difficult to know what to make of those displaced applicants who self-identified as negro but did not apply under racial quotas even though they could have. They may have declined to take advantage of quotas on principle.

⁷ Building from this exercise, Francis and Tannuri-Pianto (2012) compare and contrast racial quotas with hypothetical alternative policies.

⁸ As an extension of this methodology (see footnote 9), it is possible to shed light on the college alternatives of displacing and displaced students (not applicants) given that the PSEU asked respondents to name the other universities to which they applied and to indicate whether they were admitted. 30.8 percent of displacing and 41.5 percent of displaced students were admitted by an alternative university. Of those admitted, displacing students were admitted by institutions ranked approximately 10 positions lower. However, neither of these differences is statistically significant.

⁹ Displacing students were those admitted post-quotas but would not have been if the quota system had not existed. They are equivalent to displacing applicants as previously defined. Displaced students were those admitted pre-quotas but would not have been if the quota system had existed. They are defined as those non-negro students admitted pre-quotas with the lowest 10 percent of vestibular scores by department. The lowest 10 percent of scores were used, as

opposed to the lowest 20 percent, because some quota students would have been admitted in the absence of the policy and therefore did not displace anyone.