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Preprint · October 2018

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AFFIRMATIVE ACTION IN BRAZILIAN UNIVERSITIES: EFFECTS ON THE ENROLLMENT OF TARGETED GROUPS

Renato Schwambach Vieira [a,*] *Mary Arends-Kuenning* [a]

[a] University of Illinois at Urbana-Champaign, Urbana, IL 61801, United States

2018 – October – 17

Abstract

This paper investigates how the adoption of affirmative action for college admission affected the enrollment of students from disadvantaged backgrounds in Brazil. We explore the time heterogeneity of policy adoption by universities to identify the policy impacts while accounting for contemporaneous confounding effects. Our study shows that the adoption of affirmative action increased the enrollment of students from groups explicitly targeted by each policy, particularly public high-school students and Blacks.[1] *However, we identify that this effect was concentrated in the more competitive and more prestigious academic programs. Lastly, we find that universities that adopted affirmative action policies with explicit racial criteria experienced an increase in the enrollment of Black students; meanwhile, universities that adopted race-blind policies had no significant changes in the racial profile of their students. These results indicate that affirmative action policies were successful in improving access to higher education for targeted groups, however we also identify important limitations of these policies.*

Keywords: Affirmative Action; College; Brazil;

JEL classification: I23, I24, I28, J15

* Corresponding author. Tel. +1-217-333-0753. Email addresses: renato.sv.1988@gmail.com (R. Vieira), marends@illinois.edu (M. Arends-Kuenning)

[1] The standard racial/skin-color categories used by the Brazilian Statistical Agency (IBGE) include: *Branco* (light-skinned), *Preto* (black-skinned), *Amarelo* (yellow – mainly referring to Chinese and Japanese origin), *Pardo* (brown-skinned and/or mixed) and *Indígena* (Native American or indigenous). The Portuguese term "*Pardo"* is especially ambiguous (Cicalò, 2008), and any direct translation to English may be misleading. Therefore, following other English-written studies on the topic, we use the original Portuguese terms to refer to these standard racial categories used in Brazil. However, Brazilian affirmative action policies with a racial component were often defined to target *Preto and Pardo* students, which are jointly denoted in Portuguese as "*Negros"*. To avoid any possible confusion with the English term "Negro", which may have a derogatory connotation, we use the English word "*Blacks"* to refer to the combined groups of *Pretos* and *Pardos*.

Highlights

- Affirmative action led to more disadvantaged students in Brazilian universities
- Policy effects were concentrated in the most competitive programs
- Race-blind policies did not increase the enrollment of Black students

1. Introduction

Affirmative action policy (AAP)[2] for college admission is a common practice worldwide; it has the objective of mitigating discrimination by providing access to educational opportunities that otherwise would not be available to individuals from disadvantaged groups. This study examines the adoption of such policies in Brazil, one of the most unequal countries in the world[3] and where the educational opportunity gaps among individuals of different socioeconomic strata are some of the main channels of intergenerational inequality persistence (Barros, Foguel, & Ulyssea, 2006). Barriers to access to tertiary education are viewed as particularly relevant for reducing inequality because returns to college degrees are exceptionally high in Brazil (OECD, 2016).[4] Not surprisingly, limited access to quality higher education is an important mechanism restricting income mobility in the country (Ferreira & Veloso, 2006). Therefore, with the objective of improving the access of deprived individuals to higher education, Brazilian universities started experimenting with AAPs in the early 2000s, and within less than a decade, most public colleges had adopted some type of AAP for selecting their students. However, it is still not clear how effective these policies were in changing the profile of students enrolled in these academic programs.

This paper aims to answer that question by investigating the profile of students enrolled in academic programs subject to those policies. To identify the causal effects of AAPs, we explore the heterogeneity of policy adoption by different universities between 2004 and 2012, a period when Brazilian public universities had full discretion to define their own set of admission policies. We explore a rich dataset containing socioeconomic information from a large sample of freshmen students from all Brazilian federal

[2] List of main abbreviations and acronyms used in the paper:
- AAP: affirmative action policy
- PHSS: public high-school student
- ENADE: national exam of students achievements (the main source of data for our empirical model)

[3] With a Gini coefficient of 52.87, Brazil ranks 10th among world countries in terms of inequality as measured by this coefficient (World Bank, 2017).

[4] The OECD report indicates that, in Brazil, someone with a college degree earns on average 3.4 times more than someone with completed secondary education only. This differential is the highest among all OECD and partner countries (OECD, 2016).

universities. Using a difference-in-differences estimation strategy, we compare changes in the demographic and socioeconomic characteristics of students enrolled in Universities that introduced AAP with changes observed in institutions that did not adopt those policies. By including a control group, our estimates account for unobserved shocks that were concurrent to the adoption of AAP and that may have affected the selection of students in Brazilian higher education irrespectively of AAP adoption. We show that, before policy adoption, the trends in the shares of students from disadvantaged groups were parallel between university programs from the treatment and control groups, thus supporting the assumption of parallel paths that is required for the validity of our identification strategy. We also show that the adoption of AAP by treated universities was not associated with other changes such as position expansions that could confound our results.

Because our dataset includes a large number of academic programs from all Brazilian federal universities,[5] we are able to further investigate the heterogeneity of policy effects. First, we examine how impacts differed with respect to program competitiveness. Second, we evaluate the outcomes of distinct types of policies, contrasting race-blind with race-conscious AAPs.

Our results indicate that the AAPs evaluated in our study were effective in increasing the enrollment of individuals from groups explicitly targeted by each policy, particularly students who graduated from public high schools, a characteristic strongly associated with socioeconomic status and which was the most common eligibility criteria for the policies adopted in the period of our analysis. Additionally, while the impacts were larger for more prestigious academic programs, they were negligible for less competitive ones. Finally, and most importantly, we observed that the outcomes of the policies were limited in the case of deprived groups not explicitly targeted by each policy. For example, the enrollment of Black students was mostly unaffected by APPs with race-blind eligibility criteria. In contrast, race-conscious policies led to a significant increase in the enrollment of Blacks.

[5] Brazilian Higher Education Institutions can be divided into two main categories, public and private. Public Universities are most commonly tuition free, and in 2004 they accounted for 28% of Brazilian students in tertiary education. Public Universities can be further separated into three groups: federal, state and municipal institutions, respectively accounting for 48.8%, 40.0% and 11.2% of student in public institutions (INEP, 2005).

We also evaluated if the policy had any effects on the gender distribution and in the average academic performance of students on treated programs, however no significant results were observed for any of these variables.

Compared to the existing empirical literature, our study has the novelty of evaluating the outcomes of AAP in a setting where universities employ objective and publicly known criteria for student selection, but where institutions had discretion to experiment with different types of admission policies. In American universities — which are the object of study of the largest portion of the literature — the selection of students is based on a complex and subjective set of attributes, and universities are not required to disclose the weight of racial preferences in their admission processes, hence the exact effects of AAPs on student selection are not identifiable. Meanwhile in India, — which is another country with an extensive literature investigating the effects of AAP — public universities are required to comply with specific AAPs that are imposed by the government. Therefore, in the Indian case, there is limited heterogeneity in the policies adopted by each university, precluding the empirical comparison of outcomes from different types of policies.

Our study also differs from the existing literature that examines the effects of AAPs in Brazil, which are mostly restricted to the outcomes of individual university experiences. In contrast, our analyses comprise all Brazilian federal universities, including the ones that had not adopted any type of AAP in the period of our evaluation. That is an important contribution of our study because concomitantly with the adoption of AAPs by Brazilian universities, structural changes were taking place in the country with far-reaching impacts on the application and selection of students to tertiary education. First, the total number of undergraduate positions increased from 3.03 million in 2001 to 5.45 million in 2010. Most of this growth was associated with a large expansion of private universities, which were boosted by a set of federal programs aimed to help lower income students to cover and finance their college tuition expenses.[6]

[6] The most important of such programs were the *Student Financing Fund for Higher Education* (FIES) and the *University for All Program* (PROUNI). The first of these policies, FIES, was established in 1999, and it was designed to provide subsidized credit for students to finance their tuition and fees in private universities. By 2004, the program included 312,000 contracts, corresponding to about 10% of all students enrolled on private universities. In that same year, the Federal government created

Moreover, during this period, Brazil was experiencing a positive economic cycle, with extensive impacts on income distribution and employment.[7] Each of these factors had important impacts on the pool of students applying to and enrolling in Brazilian public universities. Hence, the isolated effects of AAP on the enrollment of deprived students is hindered by the simultaneity of these processes, and the evaluation of policy outcomes that are based on single university's experiences are likely to be overestimated as they cannot account for the effects of these simultaneous processes.

In synthesis, our paper has the novelty of examining the effects of AAPs on the enrollment of students from targeted deprived groups based on an ex-post evaluation of policy impacts on a large number of universities and several types of academic programs, accounting for time-confounding structural changes and comparing the effects of different types of AAPs in a setting where the criteria for student selection were transparent and different types of policies were adopted by different institutions.

The remainder of the paper is divided as follows. Section 2 describes in further details the use of AAPs for student admission and revisits the existing empirical literature about its impacts and the institutional background of its adoption in Brazil. Section 3 details our data and Section 4 presents our empirical strategy and discusses its results. Finally, Section 5 concludes.

2. Background

2.1. AAPs for College Admission throughout the world

In the international context, selection processes with specific rules to favor individuals from historically disadvantaged groups date from as early as the first years of the Twentieth Century when the first reservation policies were adopted in colonial British India (Laskar, 2010). However, the term

an additional program, PROUNI, a program that offered partial and total scholarships for students enrolled in private institutions. By 2013, 37.3% of private university students were beneficiaries of FIES and 11.9% of PROUNI (Corbucci, Kubota, & Meira, 2016).

[7] Between 2003 and 2014, the real income level of the Brazilian poorest 40% rose 7.1% per year (World Bank, 2017).

"affirmative action" was first coined in the 1960s when the U.S. presidency passed a set of executive orders with the objective of addressing the country's historical legacy of discrimination against minorities, particularly African Americans. Subsequently, several American universities voluntarily implemented AAPs giving preferential treatment to candidates from minority groups (Holzer & Neumark, 2006). Following this initial process, a contentious debate emerged about the use of AAP for college admission in the U.S., ultimately resulting in a set of Supreme Court landmark decisions on the legality of these policies. Still, AAP remains one of the most controversial policy topics not only in the U.S. but in other countries where it is practiced.

Interconnected with the public debate, the academic literature investigating the effectiveness and other aspects of AAPs is also extensive,[8] although the majority of empirical studies are still limited to the evaluation of policy outcomes in the USA, and more recently in India. Meanwhile, other major countries have also experimented with AAPs, including China, Brazil, South Africa, and Malaysia among others. However, the empirical investigation of policy impacts is still limited in the case of these nations.

In the USA, the existing literature indicates that AAPs have increased the probability of racial minorities to be admitted to and enrolled in American universities, particularly in top-tier colleges (Epple, Romano, & Sieg, 2008), (Long, 2004), (Arcidiacono, 2005). Similar results are observed in the case of graduation rates (Hill, 2017), (Hinrichs, 2014). However, the precise effect of these policies is not easily identifiable because American universities are not required to disclose the weight of racial preference in their admission processes (Holzer & Neumark, 2006). In recent years, state bans on race-based admission policies have been explored by empirical researchers to estimate the impacts of AAP on college access to minorities. For instance, Hinrichs (2012) and Backes (2012) report substantial reductions of African Americans, Hispanics and Native American enrollments in top American colleges after these bans. Once again, effects on less selective colleges were found to be mostly negligible. Meanwhile, Card & Krueger (2005) showed that applications to colleges by minority students with high academic performance were not

[8] For a general review of the literature on AAP, see (Holzer & Neumark, 2006).

affected by the policy bans, so the enrollment reductions of minorities could not be explained by a diversion in the applications of AAP targeted students. In a different context, Alon and Malamud (2014) showed that AAPs adopted by Israeli universities also led to a higher probability of selection, enrollment and graduation by disadvantaged students eligible for the policy, including in selective programs.

A more nuanced question about the effectiveness of AAPs is if race-blind policies also improve access to college for racial minorities. Favoring individuals based on race is one of the most controversial aspects of AAPs, therefore race-blind policies are less likely to be politically and/or legally rejected. Examples of race-blind AAPs in the USA are the "top-x%" programs, which grant admission to students ranked in the top x percentile of their high-school cohort. Because of the legal and political challenges to race-based AAPs in some American states, these programs were designed to increase university access for minority students without explicitly targeting race or ethnicity, basically by exploiting the racial segregation of American neighborhoods. Long (2004) argued that these programs would not be able to achieve the same outcomes as explicitly race-conscious AAPs. However, Kapor (2016) showed that the Texas top 10% program increased the enrollment of minority students by about 10% at Texas flagship universities and attracted students with stronger academic performances compared to typical race-conscious AAPs. This result suggests that well designed race-blind policies could be as effective as race-conscious policies in improving access to opportunities for underprivileged racial minorities. However, the generalization of such a result to other experiences is still an empirical question.

With respect to the outcomes of AAP in the developing world, the experiences of Indian universities have attracted the attention of applied economists in recent years. In contrast to the American setting, Indian universities normally rely on objective and straightforward methods for admission. Students applying to college are ranked based on their performance on standardized exams, and the top ranked students are selected for admission. Therefore, the effects of AAPs in the enrollment of students from deprived groups can be directly computed (Frisancho & Krishna, 2016). Moreover, detailed databases of students are available, allowing researchers to follow not only the applicants who were admitted to a certain college, but also those who were rejected. As a result, in the case of Indian universities, it is possible to

identify the exact students who were admitted and displaced due to AAPs, and further investigate their academic performance and post-educational outcomes. By tracking individuals who applied to Indian engineering colleges with quotas for certain castes, Bertrand, Hanna, & Mullainathan (2010) showed that those who were admitted directly because of AAP came from less wealthy households than the displaced applicants. Moreover, policy beneficiaries experienced positive returns to labor market earnings due to their college enrollment. The study also found that, while the policy eligibility was based on caste, they led to a reduction in the number of females entering engineering colleges, a result that could be explained by differences in the gender educational gap between households of different castes. Bagde, Epple, & Taylor (2016) also found that, in engineering colleges, AAPs increased enrolment of students from targeted groups, with larger effects for the most disadvantaged castes and no evidence of college "mismatch" associated with the policy.

However, the evaluations of AAP outcomes from Indian experiences are still limited in at least two dimensions. First, the existing empirical studies are restricted to a subset of academic programs, most commonly engineering, so the heterogeneity of policy effects in different careers has still not been investigated. More importantly, the AAPs practiced by Indian colleges follow government regulations that require that a certain share of positions must be reserved for disadvantaged castes in all public institutions within a same state (Bertrand, Hanna, & Mullainathan, 2010). Therefore, in the Indian setting, the AAPs adopted by different public universities are mostly homogeneous, limiting the empirical investigation of the differences in outcomes of distinct types of policies.

2.2. AAPs for college admission in Brazil

Brazil was the destination of approximately half of all enslaved individuals brought to the Americas during the Atlantic Slave Trade. It was the last Western country to abolish slavery, and consequently, it is

still one of the most unequal societies in the world.[9] One of the main mechanisms through which the institution of slavery leads to long-term impacts on income inequality is through human capital accumulation (Bertocchi & Dimico, 2014). Despite this historical background of slavery and an extreme level of socioeconomic inequality, Brazil only started adopting AAPs in the early 2000s, about 40 years after the USA and a century later than the first Indian reservation policies.

The pioneering experience with AAP for college admission in Brazil was the program the Program of Quotas at the State University of Rio de Janeiro (UERJ), which was introduced in 2003 and reserved 45% of the university positions for public high school students (PHSS), Blacks, *Indígenas*, and students with physical disabilities. In 2004, the National University of Brasília (UNB) became the first federal university to introduce an AAP for selecting its students. It established a system of quotas reserving 20% of its positions for Black applicants.[10] In the following years, several other public institutions created their own set of AAPs, and by the end of that decade, most federal universities had adopted some type of AAP in their admission processes.

In 2012, the Brazilian federal government passed a new law which led to an unprecedented expansion in the use of AAP for college admission in the country.[11] Like in the Indian case, the Law of Quotas limited the heterogeneity of AAPs in Brazilian federal universities as all institutions were obligated to follow the AAP rules imposed by the Law. However, the analyses presented in this paper explores the period that goes from the first experiences with AAP in the early 2000s to before the Approval of the Law of Quotas in 2012. During this period, Brazilian federal universities were allowed to define their own set of AAPs, including the alternative of not adopting any AAP at all.

[9] A recent economic literature has been devoted to identify the long term impacts of slavery on inequality, including (Bertocchi & Dimico, 2014), (Soares, Assunção, & Goulart, 2012), (Fujiwara, Laudares, & Caicedo, 2017).

[10] To become eligible for the system of quotas, students were required to self-identify their race. However, UnB was one of the few universities who introduced a verification system on top of that declaration. Candidates selected for admission under the system of quota were analyzed by a university commission, which was supposed to confirm the race of the candidate. This commission got national attention from the media when in 2007 a pair of identical twins were differently classified, one as *Black* and the other as *White* (G1, 2007).

[11] The national Law of Quotas specified that all federal universities should reserve, by 2016, half of its undergraduate positions to applicants from disadvantaged groups, including PHSS, Blacks, Indígenas and lower income individuals. The law required universities to start reserving its positions in 2013, with a gradually increasing quota share up to 2016.

Because the Brazilian experience with AAPs for college admission is relatively recent, the empirical literature investigating the impacts of these policies is still narrower than in the case of the USA or India. With respect to the policy effects on the enrollment of targeted students, most studies are restricted to the outcomes of specific university experiences. Examples of such studies include Cicalò (2008), Francis and Tannuri-Pianto (2011), Aranha, Pena, & Ribeiro (2012), and Estevan, Gall, & Morin (2016), each investigating the outcomes of AAPs adopted in different Brazilian public universities.

Cicalò (2008) studied the case of UERJ, observing that while the policy initially boosted the enrollment of disadvantaged students, those numbers started decreasing in later years, particularly in less competitive careers. The author argues that the policy may have saturated the demand of targeted groups for less prestigious programs. Francis and Tannuri-Pianto (2011) examined the case of UNB, where the policy was initially aimed to Black students only. They found that the share *Pretos* and *Pardos* increased after the policy adoption. Additionally, students selected through the system of quotas were more likely to come from lower socioeconomic backgrounds than displaced applicants. Importantly, their study revealed that dark-skinned candidates were more likely to identify themselves as *Pretos* and *Pardos* when compared to the period before the implementation of AAP, indicating that at least part of the policy effect could be attributed to a shift in the racial self-classification of students.

More recently, Estevan, Gall, & Morin (2016) investigated the policy of bonus points to disadvantaged applicants adopted at UNICAMP. The study followed university applicants before and after the policy adoption. Their results show a substantial increase in the enrollment of PHSS and students from lower-income households. However, although the policy included a specific bonus for Blacks, the enrollment of students from that group did not change significantly. Moreover, similarly to Card & Krueger (2005), the authors do not observe additional behavioral adjustments of applicants due to the policy, neither in terms of entrance exam *(vestibular)* performance nor in terms of application decisions.

Going beyond the evaluation of a single university experience, Lopes (2016) investigated the distribution of AAP beneficiaries across different academic majors in Brazilian public universities. The study indicates that policy beneficiaries were generally enrolled in lower-prestige programs (defined in

terms of average post-graduation earnings). Although the paper investigates a large set of universities, the analysis is restricted to cross-sectional observations of academic programs. Therefore, the author did not evaluate the impacts of AAP in the selection of students from targeted disadvantaged groups.

To the extent of our knowledge, no other study has yet analyzed the overall impacts of the introduction of AAPs in all Brazilian federal universities. The examination of individual university experiences is important for understanding in-depth the specificities of each case. However, the results from these evaluations may be limited because they do not account for unobserved factors that may be concomitant with the adoption of AAP in each university. For example, the fact that UERJ observed a saturation of applicants from disadvantaged groups may not be completely explained by the university adoption of AAP as suggested by Cicalo (2012). Instead, the expansion of private universities and the government programs to finance tuition and fees in those private institutions may have also played an important role in reducing the demand for applications to some programs at UERJ. By comparing the profile of students admitted to universities that adopted AAPs with those admitted to universities that did not, we are able to account for time-specific unobservables that could confound the analyses based solely on an individual university's policy experience.

Moreover, by analyzing universities that adopted policies with different target groups, we are able to compare the outcomes of distinct types of AAP. One of the most controversial aspects of AAPs is the provision of a benefit based on race or skin color of individuals. Therefore, understanding the differences in outcomes between race-conscious and race-blind AAPs is extremely important to inform the policy debate. In the period we analyze in our study, 34 universities adopted some type of AAP. However, only 20 of these universities included race as an eligibility criterion for their policy.[12] The remaining 14 universities adopted AAPs that defined all PHSSs as beneficiaries, regardless of their race or ethnicity.

[12] Out of these 20 universities, 17 had included both PHSSs and Blacks as AAP beneficiaries, and only 3 universities adopted AAPs targeting exclusively Black students

Therefore, while we can classify the first group as race-conscious policies, the second group we classify as race-blind AAPs.

The fact that most Brazilian Universities targeted PHSS within their AAPs can be explained by the institutional segregation of students in Brazilian primary and secondary education. Public schools are free of charge at all levels of education; however, the quality of public primary and secondary schools is on average inferior when compared to their private counterparts. Moreover, enrollment in private secondary schools is strongly associated with higher income and socioeconomic status of households. Therefore, the type of secondary education is an easily identifiable indicator of lower socioeconomic background in Brazil, which is unlikely to be manipulated and is less subject to the controversies associated with racial identification and race-based favoring.[13] However, the statistical overlap between race and income may not guarantee that race-blind policies could be as effective as race-conscious policies in terms of improving the access of racial minorities. For instance, Darity, Deshpande and Weisskopf (2011) argue that class-based AAPs are inherently less effective than group-based policies to improve the access of discriminated groups, particularly when access to opportunities is based on some type of performance. However, the magnitude of this policy differential in the case of Brazilian colleges is ultimately an empirical question. Therefore, we take advantage of the fact that AAPs in our dataset were heterogeneous in terms of eligibility criteria to investigate whether there were any significant differences between the outcomes of race-blind and race-conscious policies, particularly with respect to the enrollment of racial minorities.

[13] For a detailed review of this topic, we refer to Daflon, Júnior, & Campos (2013).

3. Data

3.1. Timeline of AAP adoption in Brazilian Federal Universities

Before the approval of the Law of Quotas in 2012, Brazilian federal universities had flexibility to define their own set of admission policies. In 2004, UNB became the first federal university to introduce an AAP for selecting its students, and in the following years other Brazilian universities adopted their own set of AAPs. To identify the moment of adoption and the exact policies implemented by each university, we collected information from university councils' minutes and admission process notices[14] from the period of 2004 to 2012.[15]

From these documents, we constructed the timeline of AAP adoption by Brazilian federal universities, which is presented in Table 1. Moreover, we were also able to identify the exact admission rules adopted by each institution. Appendix A details the admission policies of each federal University included in our study, and Table 2 summarizes the heterogeneity of policies with respect to their target groups, indicating the total number of universities that adopted race-blind or race-conscious AAP in the period.

[14] In Portuguese, these documents are referred as "*Editais de Chamada dos Processos Vestibulares"*.

[15] The documents used to construct our timeline of affirmative action adoption by Brazilian federal universities are available at: http://rsvieira.com/projects/AA/timeline_documents/AA_adoption_documents.zip

TABLE 1: BRAZILIAN FEDERAL UNIVERSITIES BY YEAR OF AAP ADOPTION (2004-2013)

University	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
UnB	x	x	x	x	x	x	x	x	x	x
UFAL		x	x	x	x	x	x	x	x	x
UFBA		x	x	x	x	x	x	x	x	x
UFG		x	x	x	x	x	x	x	x	x
UFPE		x	x	x	x	x	x	x	x	x
UFPR		x	x	x	x	x	x	x	x	x
UFRPE		x	x	x	x	x	x	x	x	x
Unifesp		x	x	x	x	x	x	x	x	x
UFT		x	x	x	x	x	x	x	x	x
UFJF			x	x	x	x	x	x	x	x
UFPA			x	x	x	x	x	x	x	x
UFPB			x	x	x	x	x	x	x	x
UFRN			x	x	x	x	x	x	x	x
UFABC				x	x	x	x	x	x	x
UFMA				x	x	x	x	x	x	x
UFPI				x	x	x	x	x	x	x
UFES					x	x	x	x	x	x
UFF					x	x	x	x	x	x
UFRGS					x	x	x	x	x	x
UFSC					x	x	x	x	x	x
UFSCar					x	x	x	x	x	x
UFSM					x	x	x	x	x	x
UTFPR					x	x	x	x	x	x
UFMG						x	x	x	x	x
Ufop						x	x	x	x	x
UFTM						x	x	x	x	x
UFRRJ							x	x	x	x
UFS							x	x	x	x
UFSJ							x	x	x	x
Univasf							x	x	x	x
URG							x	x	x	x
UFRJ								x	x	x
UFU								x	x	x
UFMT									x	x
UFAC										x
UFAM										x
UFC										x
UFCG										x
Ufla										x
UFMS										x
UFPEL										x
UFRR										x
UFV										x
Unifal										x
UNIFAP										x
Unifei										x
Unir										x
Unirio										x

Notes: The timeline was constructed based on the admission exam notices of universities.
Further details about the policies adopted in each university are described on Appendix A

TABLE 2: TYPES OF APPS ADOPTED BY BRAZILIAN FEDERAL UNIVERSITIES (2004-2010)

	Universities	Ratio
Federal Universities	48	100.0%
Adopted AAPs	34	70.8%
Race-Blind Policies	14	29.2%
Race-Consious Policies	20	41.7%
Without AAPs	14	29.2%

Notes: Further details about the policies adopted in each university are described on Appendix A.

3.2. ENADE

For the period covered in our analysis, there is no database available with the characteristics of students enrolled in Brazilian public universities. Therefore, to identify the effects of AAP, we explore data from ENADE, a yearly exam conducted by the Brazilian National Government which is mandatory for students matriculated at federal universities.[16] The exam was created in 2004 with the objective of accessing the quality of tertiary education in the country. Students taking ENADE are required to fill out a socioeconomic form that includes questions about household socioeconomic characteristics and students' educational background. We use this self-reported information to tabulate the profile of students enrolled in the academic programs of Brazilian federal universities in the period of our analysis. The main variables used in our study include the race of students, household income, parents' education, gender, whether the student attended a public or private secondary school, and scores on the ENADE exam.

Our main goal is to identify the characteristics of students enrolled in each academic program and how they changed after the adoption of AAP. To answer this question, we restrict the total sample of

[16] State universities are not required to participate in ENADE, although most of them join it voluntarily. A notable exception is the University of São Paulo, Brazilian largest public university, which did not participate in the exam until 2016.

students who took ENADE to freshmen from federal universities in academic programs that were observed in at least two different rounds of ENADE. Until 2010, the exam was taken both by students in the first and final years of selected academic programs. However, in 2011, the examination of freshmen was discontinued, so our analysis is restricted to the period of 2004 to 2010. Hence, our final sample includes 170,555 freshmen students who took the ENADE exam between 2004 and 2010.[17] These students were enrolled in 1,025 academic programs from 47 different federal universities,[18] and the median cohort in our sample had 54 students. Table 3 presents additional descriptive statistics of the sample of students included in our analysis.

[17] Between 2004 and 2010 there were 983,695 freshmen students enrolled in the Brazilian federal universities included in our analysis. Although the ENADE exam was mandatory for freshmen students from federal universities, our sample is not equal to that total due to the following reasons: 1) not all academic majors are included in the ENADE exam; 2) Program are only evaluated every three years, so even for academic majors included in the exam, the sample only includes the freshmen from the year when each program is evaluated. 3) The exam takes place in the end of year, so students who drop out between enrollment and the exam date are also not included. Still, the sample used in our study is the largest available dataset with student level information for the period evaluated in our analysis.

[18] UFABC only started participating at ENADE in 2011 http://www.ufabc.edu.br/noticias/alunos-da-ufabc-farao-a-prova-do-enade-pela-1o-vez.

TABLE 3: DESCRIPTIVE STATISTICS – FRESHMEN STUDENTS FROM FEDERAL UNIVERSITIES (ENADE 2004-2010)

	obs.	share	share (excluding NAs)
Race			
Branco	63,136	37.0%	60.3%
Preto	6,653	3.9%	6.4%
Pardo	32,160	18.9%	30.7%
Amarelo	1,677	1.0%	1.6%
Indígena	1,141	0.7%	1.1%
NA	65,788	38.6%	-
Type of High School			
All public	41,989	24.6%	40.0%
Partial	11,114	6.5%	10.6%
All private	51,741	30.3%	49.4%
NA	65,711	38.5%	-
Mother Education			
None	2,346	1.4%	2.2%
4th grade	13,885	8.1%	13.3%
8th grade	12,485	7.3%	11.9%
Secondary	36,729	21.5%	35.1%
Higher	39,260	23.0%	37.5%
NA	65,850	38.6%	-
Sex			
Female	88,418	51.8%	51.8%
Male	82,137	48.2%	48.2%
NA	0	0.0%	-

Notes: The sample includes all freshmen students from Brazilian federal universities who took the ENADE exam between 2004 and 2010

TABLE 4: ENADE'S SAMPLE OF FRESHMEN FROM FEDERAL UNIVERSITIES BY ACADEMIC MAJOR (2004-2010)

Major	2004	2005	2006	2007	2008	2009	2010	Total
Group 1								
Medicine	1,544	-	-	1,527	-	-	4,821	7,879
Nursing	1,202	-	-	1,595	-	-	3,658	6,511
Agronomy	1,315	-	-	1,836	-	-	3,774	6,558
Pharmacy	1,083	-	-	1,073	-	-	2,758	5,139
Social Services	1,097	-	-	1,054	-	-	2,573	5,038
Veterinary	710	-	-	1,198	-	-	2,440	4,192
Dentistry	787	-	-	948	-	-	2,270	4,084
Nutrition	678	-	-	904	-	-	1,820	3,635
Zootechnics	610	-	-	1,251	-	-	1,771	3,560
Kinesiology	1,382	-	-	1,610	-	-	1,407	4,730
Physiotherapy	296	-	-	293	-	-	776	1,774
Speech Therapy	157	-	-	119	-	-	259	789
Group 2								
Engineering	-	8,052	-	-	13,127	-	-	20,666
Pedagogy	-	2,403	-	-	4,396	-	-	7,009
Language	-	3,369	-	-	4,033	-	-	7,333
Biology	-	1,603	-	-	3,922	-	-	5,464
Mathematics	-	2,122	-	-	3,262	-	-	5,543
Chemistry	-	1,495	-	-	2,977	-	-	4,502
Computer Science	-	1,583	-	-	2,631	-	-	4,335
Physics	-	1,674	-	-	2,683	-	-	4,317
History	-	1,934	-	-	2,483	-	-	4,414
Geography	-	1,190	-	-	1,844	-	-	3,380
Social Sciences	-	1,182	-	-	1,635	-	-	2,952
Philosophy	-	756	-	-	996	-	-	2,076
Architecture	-	510	-	-	1,005	-	-	1,665
Group 3								
Business	-	-	2,633	-	-	8,207	-	11,098
Law	-	-	2,245	-	-	5,953	-	8,289
Economics	-	-	2,016	-	-	4,195	-	6,452
Accounting	-	-	1,773	-	-	4,305	-	5,959
Social Communication	-	-	1,674	-	-	2,530	-	4,327
Psychology	-	-	1,261	-	-	2,317	-	3,604
Music	-	-	742	-	-	1,720	-	2,909
Library science	-	-	1,134	-	-	1,731	-	2,987
Tourism	-	-	605	-	-	964	-	1,741
Design	-	-	513	-	-	1,011	-	1,687
Dramaturgy	-	-	536	-	-	812	-	1,533
Executive Secretariat	-	-	218	-	-	271	-	594
Other								
Biomedicine	-	-	279	276	-	-	616	1,257

* Does not include technology programs

It is worth noticing that the ENADE exam does not include all academic programs every year; instead, the exam is divided in cycles of three years. Academic majors[19] are divided into three different groups, and

[19] In Brazilian universities, students select their majors when they apply to the university. In most cases, if a student decides to change major after starting a program, he or she needs to retake the university entrance exam.

each group is evaluated every three years.[20] Therefore, because the sample of freshmen is restricted to the period of 2004 to 2010, we can only observe each university-program in either two or three rounds of the exam. Table 4 shows the academic majors included in each round of ENADE between 2004 and 2010, indicating the number of freshmen students from federal universities taking the exam every year.[21] In the next section, we detail our empirical model, presenting the main results and addressing potential limitations of our analysis.

4. Empirical Model and Results

The goal of our analysis is to identify how AAPs changed the characteristics of students enrolled in academic programs. The key for our identification strategy is the time heterogeneity in the adoption of AAP in each Brazilian federal university in the period of our analysis. Using a differences-in-differences strategy, we compute the changes in the average characteristics of freshmen students in each academic program of our sample. The policy effects are then calculated as the average difference in those changes between programs from universities that adopted AAP and those that did not adopt any policy.

4.1. Baseline Model

We start our empirical analysis by defining a pooled model that estimates the average policy effect in all programs that adopted AAP in the period. However, because each academic program is only observed once every three years, we separate observations into two cycles of three years each. The first cycle includes students who took the exam in 2005, 2006 and 2007,[22] and the second cycle includes observations from

[20] For example, medicine programs were evaluated in 2004, 2007 and 2010.

[21] Appendix B shows the total number of observations by year and by federal university.

[22] In the baseline model, we exclude the observations from 2004. By doing that, all academic programs are observed in the same number of periods. If instead, we had part of the observations with three periods and part with two, we would need to estimate an additional set of coefficients that would be specific for the former group, hindering the interpretation of results. In Session III.B we use the group of programs observed in three different cycles to evaluate if pre-treatment trends were parallel between treatment and control groups.

2008, 2009 and 2010. With this setup, each academic program is observed twice, and our baseline empirical model can be described by the following equation:

$$y_{pt} = \alpha_p + (\beta + \gamma\, ET_p + \delta\, LT_p) \cdot Post_t + \varepsilon_{pt} \quad (1)$$

For each observation of an academic program p,[23] the dependent variable y_{pt} represents either the share[24] of students from a certain disadvantaged group – Blacks, public high-school students, parents with at most primary education attainment, or female – or the average normalized ENADE score of students from that program when observed in ENADE cycle t (2005-2007 or 2008-2010). The coefficient α_p is a university-program fixed effect that does not vary over time, and it captures the average characteristics of students in each program in the first cycle. The variable $Post_t$ is an indicator variable for observations from the second cycle of exams. It takes the value of 1 for observations of programs in the 2008-2010 cycle, and it takes the value of zero otherwise:

$$\begin{aligned} Post_t &= 0 \quad if \quad t \in (2005, 2006, 2007) \\ Post_t &= 1 \quad if \quad t \in (2008, 2009, 2010) \end{aligned} \quad (2)$$

Therefore, the coefficients β, γ and δ compose the average changes of student shares when comparing the second to the first cycle. While β is the average change observed throughout all academic programs, γ is a specific component for programs that had already adopted AAP in the first cycle, that is, the Early Treatment (ET) group. Similarly, δ is the equivalent coefficient for the Late Treatment (LT)

[23] A university program is defined as an academic major from a specific university. For example, the program of Law at UnB.

[24] All shares are calculated excluding observations for which information is not available. This restriction would affect our results if the distribution of characteristics among students whose information is not available significantly differs from those for which information is available. Therefore, the equivalence between those distributions is currently an untestable assumption that is required for the validity of our results. For an extension of this paper, we are working with the Brazilian Ministry of Education to retrieve information for each student based on their high-school national exams (ENEM).

group, which are the programs which had no AAP during the first cycle but had adopted it in the second cycle. Programs without any AAP in neither the first or second cycles are defined as Controls (Co). Therefore, the average change of student characteristics is calculated by different coefficient compositions for each group of programs. While for the Co group the average change is given by β, for the ET group it is given by $\beta + \gamma$ and for the LT group it is given by $\beta + \delta$. Therefore, the coefficient δ can be interpreted as the average treatment effect of AAP adoption if we assume that β corresponds to the counterfactual change that would be expected in Late Treatment programs if their universities had not adopted any AAP.[25]

As for the dependent variables used in our models, we investigate the share of students with different characteristics that are commonly associated with a disadvantaged condition in the Brazilian context. These variables cover the dimension of race, type of secondary school, socioeconomic background and gender. In the case of race, we analyze the share of Blacks in each program, which is defined as the sum of students who self-classify as either *Preto* or *Pardo*. For the type of secondary school, we focus on students who reported completing all of their secondary education in public schools.

With respect to the socioeconomic background, we define as an indicator of lower strata the students who report that their parents have not studied beyond primary education.[26] Ideally, we would like to use a variable directly associated with students' household wealth, however the only information available are household income brackets, which is not consistent between different years of the exam and that we believe is more likely to be misreported by students. However, it is well established in the economic literature that education attainment is closely associated with income and wealth. Additionally, the education attainment of students' parents are consistently available in our datasets, and we believe it is less likely for students to misreport this variable. Therefore, we use parents' education attainment as our preferred proxy for the economic background of students.

[25] Similarly, the coefficient γ can be interpreted as a lagged effect of AAP on the Early Treatment group.

[26] That is, the indicator only takes a value of one if neither the mother nor the father have studied beyond primary education.

We also analyze the share of female students in each program to verify whether the expansion of AAP was associated with any indirect effect in the enrollment of women in tertiary education. Bertrand, Hanna, & Mullainathan (2010) reported that caste-based AAPs in India led to a reduction in the overall number of females entering engineering colleges, so it would be worth investigating if a similar result is observed in the Brazilian case.

Finally, we also evaluate changes in average ENADE scores of students in each program. While we are aware of the limitations of the ENADE score as a measure of student abilities, we still include this estimation in our analysis, so we can compare our results with previous findings in the literature of AAP mismatch hypothesis. In the case of this variable, the dependent variable does not represent a share. Instead, it is the average exam score per cohort that is normalized based on the average score and standard deviation of all freshmen students from federal universities from the same major who took the exam in a specific year.[27]

Before presenting the regression results, Table 5 shows the descriptive characteristics of the dependent variables used in our empirical analysis by treatment status of the academic programs and by ENADE cycle. It is worth noticing that even before the adoption of AAPs, the average shares of Blacks and PHSS was already above 30% in both the control and late treatment programs in the 2005-2007 cycle. Meanwhile, the shares of students whose parents have not attained beyond primary education was slightly below 20% in both treatment groups, and it was about 25% in the control group. In all cases, the share of females was always slightly above 50%. The table indicates that the average shares of disadvantaged students, as described by the variables included in our analysis, have increased in all groups of programs if we compare the second and the first periods. The only exception is the share of students whose parents have not attained beyond primary education in the case of programs from the control group, where the share went from 25.2% in the first period to 24.8% in the second. While the average increases in shares seem to have been larger on the late treatment group, our empirical model tests the magnitude and significance of these differences.

[27] For example, a cohort with a normalized score of 0.5 indicates that the average score of students was 0.5 standard deviations higher than the mean score of all freshmen students from federal universities who took the same exam.

TABLE 5: DESCRIPTIVE CHARACTERISTICS OF DEPENDENT VARIABLES IN OUR SAMPLE OF ACADEMIC PROGRAMS BY TREATMENT GROUP AND BY ENADE CYCLE

	Period *(ENADE Cycle)*			
	2005-2007 *(pre)*		2008-2010 *(post)*	
	mean	s.d.	mean	s.d.
A: Late Treatment Programs (n=347)				
Share[a]				
Black[b]	0.300	0.226	0.327	0.213
PHSS[c]	0.356	0.203	0.433	0.181
Low-educ. Parents[d]	0.179	0.150	0.196	0.144
Women	0.532	0.236	0.553	0.223
ENADE Score[e]	0.158	0.949	0.160	0.978
B: Early Treatment Programs (n=257)				
Share				
Black	0.451	0.224	0.480	0.211
PHSS	0.323	0.194	0.413	0.189
Low-educ. Parents	0.166	0.144	0.192	0.152
Women	0.541	0.239	0.562	0.214
ENADE Score	-0.041	1.091	0.011	1.082
C: Control Programs (n=445)				
Share				
Black	0.388	0.209	0.394	0.192
PHSS	0.447	0.250	0.491	0.253
Low-educ. Parents	0.252	0.203	0.248	0.181
Women	0.515	0.225	0.536	0.222
ENADE Score	-0.030	1.048	-0.006	1.066

Notes: The sample includes all academic programs from Brazilian Federal Universities that had freshmen students taking the ENADE exam both in the 2005-2007 period and in the 2008-2010 period.

[a] All shares are calculated excluding observations for which data is not available

[b] Black: refers to the combined group of Pretos and Pardos

[c] PHSS: Public High School Student (all years)

[d] Low-educ parents: none of the student's parents have studied beyond primary education

[e] The ENADE score is normalized based on the score of all freshmen students from federal universities with the same academic major

Table 6 shows the regression results for our baseline specification where the treatment effect is pooled across all academic careers and types of AAP. The main coefficient of interest in each regression is the interaction between the indicators of observations from the late treatment group in the second cycle of ENADE exams ($Late\ Treatment \times Post$), which corresponds to coefficient δ in Equation 2. These

coefficients can be interpreted as the average changes in the dependent variables for academic programs from universities that adopted AAP compared to the changes observed in the control group. The results show that the share of Blacks, PHSS and Low-Education Parents increased significantly more for programs that adopted AAPs compared to the control group. The increase in the enrollment of Blacks was 2.2 percentage points (pp) higher for treated universities compared to the average change observed for the control programs (1.3 p.p.). Meanwhile the increase in the share of PHSS was 3.6 p.p., and students with low-education parents experienced increases of 2.6 p.p. above those of the control group. These results confirm that, on average, the groups targeted by the AAPs had a positive and significant enrollment gain in treated programs compared to programs from universities that did not adopt any type of AAP.

TABLE 6: REGRESSION RESULTS - AVERAGE CHANGES IN THE SHARE OF STUDENTS FROM DIFFERENT DISADVANTAGED GROUPS BY PROGRAM TREATMENT STATUS

	Dependent variable:				
	Black[a]	PHSS[b]	Low-educ parents[c]	women	ENADE score[d]
	(1)	(2)	(3)	(4)	(4)
Late Treatment (LT[e] × Post [g])	0.022*	0.036**	0.026**	0.003	-0.046
	(0.009)	(0.011)	(0.009)	(0.007)	(0.027)
Early Treatment (ET[f] × Post)	0.021*	0.045***	0.023*	-0.009	0.094**
	(0.010)	(0.012)	(0.010)	(0.007)	(0.029)
Control (Post)	0.013*	0.035***	-0.006	0.023***	0.007
	(0.006)	(0.007)	(0.006)	(0.005)	(0.018)
Program FE	yes	yes	yes	yes	yes
Observations	2,012	2,012	2,012	2,050	2,032
Adjusted R^2	0.847	0.789	0.772	0.924	0.628

notes: *p<0.05, **p<0.01, ***p<0.001.

In columns (1)-(4), coefficients can be interpreted as absolute percent point (p.p.) changes. E.g., a coefficient of 0.1 indicates an average increase of 10p.p.

The coefficients for the Late Treatment and Early Treatment groups are interpreted as the average change in each variable that was observed in addition to the corresponding average change in the Control group. E.g., a coefficient of 0.1 for the Late Treatment group indicates that the variable increased, on average, 10p.p. more on that group if compared to the control group.

[a] Black: refers to the combined group of Pretos and Pardos

[b] PHSS: Public High School Student (all years)

[c] Low-educ. parents: none of the student's parents have studied beyond primary education

[d] The score is normalized based on the mean score and s.d. of freshmen from federal universities in each major

[e] LT: Late AAP Adopters. Programs that had no AAP in 2005-2007, but adopted it in 2008-2010

[f] ET: Early AAP Adopters. Programs that adopted AAP in 2005-2007

[g] Post: dummy indicating the second cycle of ENADE exams (2008, 2009 and 2010)

No significant effects were observed associating the adoption of AAP with the share of women or the average ENADE score of students. A major criticism of AAP is that it could lead to the selection of poorly prepared students, causing a reduction in the overall quality of programs. However, in line with most of the empirical literature investigating this question, we do not observe any significant changes in the ENADE score of students from universities after they adopted AAP. If anything, we do observe an average increase of 0.094 standard deviations in the ENADE score of programs that were early AAP adopters. Although ENADE is limited as a measure of academic abilities, an interesting aspect of our result is that all students included in our sample are freshmen, so the similarity in performance between treated and untreated groups cannot be explained by AAP beneficiaries catching up to non-beneficiaries during the college years.

As for the other coefficients estimated by our model, the results indicate that for the Early Treatment group, the shares of Blacks and PHSS grew by respectively 2.1 p.p. and 4.5 p.p. above the control group, a result that contradicts the concern of a possible saturation in the demand for public higher education from disadvantaged students as raised by Cicalo (2008), at least in the initial years after the adoption of AAP.

Finally, it is also interesting to notice the overall changes of student characteristics which are described by the coefficient for $Post$ only. These results indicate positive and significant average changes in the shares of Blacks, PHSSs and women, even for programs where AAP was not adopted. These results highlight the importance of comparing the changes of programs that adopted AAP with other programs in order to avoid overestimating the treatment effects of AAP.

4.2. Heterogeneous Effect by Program Competitiveness

An important question about the effectiveness of AAPs relates to the heterogeneity of the policy impact with respect to programs' prestige. The literature based on the American experience indicates that AAP effects are usually restricted to top tier institutions. Meanwhile the policies seem to have negligible

effects in less prestigious programs (Epple, Romano, & Sieg, 2008), (Long, 2004), (Arcidiacono, 2005), Hinrichs (2012), (Backes, 2012). However, with respect to the Brazilian experience, the existing results from the literature are not yet clear. While AAP beneficiaries seem to be more concentrated in less prestigious academic programs (Cicalò, 2008), (Lopes, 2016), there is yet no evidence on how the expansion of AAPs has changed the enrollment of disadvantaged students in academic programs with different levels of competitiveness for admission.

To investigate this question, we estimate an extended version of our baseline model where we interact the treatment effect of AAP with a measure of program competitiveness (C_{pj}):

$$y_{pt} = \alpha_p + \sum_j \left(\left(\beta_j + \gamma_j ET_p + \delta_j LT_p \right) \cdot Post_t \cdot C_{pj} \right) + \varepsilon_{pt} \quad (3)$$

Differently from the baseline pooled model, the coefficients β, γ and δ are disaggregated for programs with different levels of competitiveness j. It is important to notice that we define the competitiveness of each program based on their corresponding minimum SISU score for general admission in 2016.[28] Based on this metric, we separate programs into three categories: low-, medium- and high-competitiveness. We divide the programs into 3 quantiles, so the cutoff scores for each group are defined at 645 and 700 points at SISU, leading the indicator variables C_{pj} to be defined as:

[28] The minimum score for admission for each program was taken from the SISU of 2016, which is a unified system of student admission for Brazilian universities that was established in 2010. Ideally, it would be preferred to use a metric of competitiveness directly associated with the period of our analysis. Although it is unlikely that competitiveness rankings changed dramatically between 2010 and 2016, we use the SISU cutoff score from 2016 for measuring program competitiveness for two main reasons: 1) not all universities adopted SISU when it was created in 2010. However, in 2016 the majority of universities were already part of it, so, by using the cutoff score of 2016, we have a comparable metric of competitiveness for almost all programs included in our sample. 2) The minimum SISU score for each program before 2016 could be associated with the adoption of AAPs before the Law of Quotas, hence confounding competitiveness with different levels of quotas. However, by 2016, all federal universities have adopted an homogenized set AAP due to the Law of Quotas.

$$
\begin{aligned}
C_{p,low} &= 1 \quad if \quad SISU_p < 645 \\
C_{p,low} &= 0 \quad otherwise
\end{aligned}
$$

$$
\begin{aligned}
C_{p,med} &= 1 \quad if \quad 645 < SISU_p < 700 \\
C_{p,med} &= 0 \quad otherwise
\end{aligned}
\tag{4}
$$

$$
\begin{aligned}
C_{p,hig} &= 1 \quad if \quad 700 < SISU_p \\
C_{p,hig} &= 0 \quad otherwise
\end{aligned}
$$

Figure 1 shows the histogram of the SISU 2016 minimum score for admission in the academic programs included in our analysis and how they relate to the competitiveness categories we have just defined. To support the interpretation of results from this model, Table 7 shows the descriptive statistics of the variables used in our analysis for the subset of highly competitive programs. It is worth noticing that, as expected, the shares of disadvantaged students on highly competitive programs is considerably smaller if compared to the pooled shares presented in Table 5.

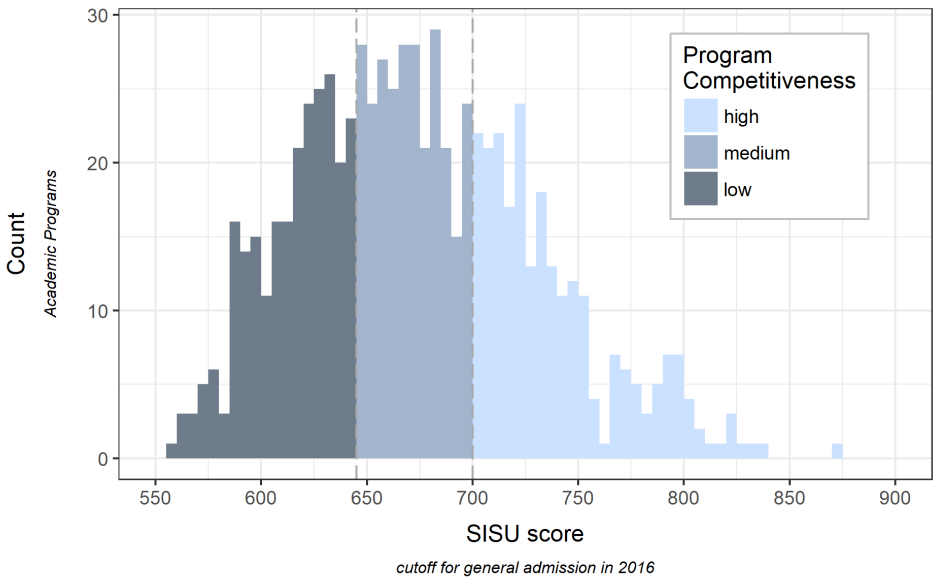

FIGURE 1: HISTOGRAM OF MINIMUM SISU SCORE FOR GENERAL ADMISSION IN 2016 - FEDERAL UNIVERSITY PROGRAMS INCLUDED IN THE ENADE EXAMS OF 2004-2010

TABLE 7: DESCRIPTIVE CHARACTERISTICS OF DEPENDENT VARIABLES FOR HIGHLY COMPETITIVE ACADEMIC PROGRAMS (MINIMUM SISU SCORE FOR ADMISSION > 700) BY ENADE CYCLE AND BY TREATMENT GROUP

	Period *(ENADE Cycle)*			
	2005-2007 *(pre)*		2008-2010 *(post)*	
	mean	s.d.	mean	s.d.
A: Late Treatment Programs (n=76)				
Share[a]				
Black[b]	0.225	0.206	0.283	0.212
PHSS[c]	0.270	0.175	0.347	0.166
Low-educ. Parents[d]	0.107	0.111	0.121	0.105
Women	0.537	0.226	0.554	0.232
ENADE Score[e]	0.246	0.988	0.154	0.858
B: Early Treatment Programs (n=68)				
Share				
Black	0.404	0.229	0.434	0.223
PHSS	0.256	0.156	0.370	0.159
Low-educ. Parents	0.118	0.101	0.134	0.118
Women	0.579	0.191	0.581	0.185
ENADE Score	-0.044	1.122	-0.047	1.070
C: Control Programs (n=100)				
Share				
Black	0.300	0.142	0.310	0.143
PHSS	0.246	0.154	0.222	0.137
Low-educ. Parents	0.095	0.085	0.084	0.089
Women	0.526	0.209	0.557	0.215
ENADE Score	-0.013	1.089	0.343	1.207

Notes: The sample includes all academic programs from Brazilian Federal Universities that had freshmen students taking the ENADE exam once in the 2005-2007 period and once in the 2008-2010 period, and where the minimum score for admission in the SISU 2016 was above 700 points

[a] All shares are calculated excluding observations for which data is not available

[b] Black: refers to the combined group of Pretos and Pardos

[c] PHSS: Public High School Student (all years)

[d] Low-educ. parents: none of the student's parents have studied beyond primary education

[e] The ENADE score is normalized based on the score of all freshmen students from federal universities with the same academic major

Table 8 shows the results for the regressions where we interacted the original pooled treatment groups with an indicator of competitiveness for each academic program as described by Equation 3. Overall, the results indicate that the effects of AAP adoption were restricted to the more competitive programs, where the shares of Blacks and PHSS increased respectively by 5.1 p.p. and 9.8 p.p. above the corresponding control group. Meanwhile, the average changes for low-competitive programs were roughly

negligible and statistically not different from zero. The results for more competitive programs are especially relevant if we consider the distribution of disadvantaged students before the policy adoption. As shown in Table 8 the average shares of Blacks and PHSS for late treatment programs was respectively 22.5% and 27%. Therefore, the average treatment effects of 5.1 p.p. and 9.8 p.p. represent average relative increases of 22.6% in the share of Blacks and 36% in the share of PHSS that were caused by the adoption of AAP in highly competitive programs.

TABLE 8: REGRESSION RESULTS - AVERAGE SPECIFIC CHANGES IN THE SHARE OF STUDENTS FROM DIFFERENT DISADVANTAGED GROUPS ON LATE TREATMENT PROGRAMS BY PROGRAM COMPETITIVENESS

	Dependent variable:				
	Black[a]	PHSS[b]	Low-educ parents[c]	women	ENADE score[d]
	(1)	(2)	(3)	(4)	(5)
Low-Compet.($C_{low}^{h} \times LT^{e} \times Post^{f}$)	0.013	0.013	0.023	-0.021	0.011
	(0.025)	(0.029)	(0.024)	(0.017)	(0.068)
Medium-Compet.($C_{med}^{h} \times LT^{e} \times Post^{f}$)	0.007	0.006	0.008	0.018	-0.117*
	(0.019)	(0.022)	(0.018)	(0.013)	(0.053)
High-Compet.($C_{hig}^{h} \times LT^{e} \times Post^{f}$)	0.051**	0.098***	0.032	-0.003	-0.023
	(0.018)	(0.021)	(0.017)	(0.013)	(0.050)
Program FE	yes	yes	yes	yes	yes
Observations	1,464	1,464	1,464	1,490	1,478
Adjusted R^2	0.847	0.804	0.779	0.933	0.633

notes: *p<0.05, **p<0.01, ***p<0.001.

In columns (1)-(4), coefficients can be interpreted as absolute percent point (p.p.) changes. E.g., a coefficient of 0.1 indicates an average increase of 10p.p.

The coefficients are interpreted as the average change in each variable for the Late Treatment group if compared to the corresponding Control group. E.g., a coefficient of 0.1 for the Low-Compet. indicates that the variable increased on average 10p.p. more on that low competitiveness treated programs if compared to the average change in the low-competitiveness control group.

For conciseness, we omit the coefficients of the interactions between competitiveness, ET and Co programs. Appendix D reports the whole set of coefficients estimated from this model.

[a] Black: refers to the combined group of Pretos and Pardos

[b] PHSS: Public High School Student (all years)

[c] Low-educ. parents: none of the student's parents have studied beyond primary education

[d] The score is normalized based on the mean and s.d. of all federal university freshmen from federal universities with the same major

[e] LT: Late AAP Adopters. Programs that had no AAP in 2005-2007, but adopted it in 2008-2010

[f] ET: Early AAP Adopter: Programs that adopted AAP in 2005-2007

[g] Post: dummy indicating the second cycle of ENADE exams (2008, 2009 and 2010)

[h] Program competitiveness was defined based on the minimum SISU score of 2016. For details, see Figure 1.

The results for the share of students whose parents have not attained beyond primary education also indicate a larger effect of 3.2 p.p. increase for highly competitive programs. However, this result is not statistically significant at 5% confidence level.

On the other hand, we have not observed any substantial changes in the gender composition of cohorts in any of the competitiveness groups included in our analysis. Finally, the non-significant effects on the average ENADE score of more competitive programs can be understood as an evidence against the mismatch hypothesis because these are the programs where one would expect a larger gap between beneficiaries and their peers. Although we believe this is an interesting result, it should be viewed with caution due to the limitations of ENADE as a metric for students' performance. Further research with better metrics would be required for a more detailed investigation of this question.

In synthesis, the results from this analysis indicate that the effects of AAPs on improving the enrollment of students from disadvantaged backgrounds in Brazil were mostly concentrated on the high-competitive programs, a result that is in line with what was previously found for American experiences with AAP.

4.3. Race-Blind vs Race-Conscious Policies

We now move our analysis to investigate the effectiveness of race-blind policies to indirectly improve the access of racially discriminated groups to college in Brazil. We classify the AAPs adopted by the universities in our sample as race-blind (RB) if they do not include race or ethnicity as an eligibility criterion and race-conscious (RC) if they do. We then estimate the following extension of our baseline pooled model:

$$y_{pt} = \alpha_p + \left(\beta + \gamma_{RB}\, ET\_RB_p + \gamma_{RC}\, ET\_RC_p + \delta_{RB}\, LT\_RB_p + \delta_{RC}\, LT\_RC_p\right) \cdot Post_t + \varepsilon_{pt} \qquad (4)$$

Here, each treatment group (ET and LT) are further divided into race-blind (RB) or race-conscious (RC). The interpretation of coefficients mostly mirrors the baseline pooled model. However, within this specification, the main question is the existence of differences between δ_{RC} and δ_{RB}, that is, the LT specific average changes in the profile of students after the adoption of AAP, particularly in the case of dependent variables associated with racial characteristics.

Table 9 presents the results of this estimation. Given that we've found the effects of AAPs to be mostly concentrated on highly competitive programs, we estimate this model with two different datasets, A) using all programs from our dataset; B) restricting the sample to the highly competitive programs only.

The results indicate that race-conscious policies were associated with a larger increase of Blacks, PHSS and students with low-educated parents if compared to race-blind policies. Not only were the results larger, but in the case of the enrolment of Blacks and of people whose parents had low education attainment, the outcomes of race-blind AAPs were not statistically different from the control group. In the case we restrict the analysis to highly competitive programs, the results are still in the same direction. Race-conscious policies are associated with a substantial and significant increase of all types of socioeconomically disadvantaged groups. Meanwhile, the results of race-blind policies are slightly larger if compared to the pooled estimation, but still, results are not statistically different from the control group except in the case of PHSS.

TABLE 9: REGRESSION RESULTS – AVERAGE SPECIFIC CHANGES IN THE SHARE OF STUDENTS FROM DIFFERENT DISADVANTAGED GROUPS ON LATE TREATMENT PROGRAMS BY TYPE OF AAP (RACE-BLIND OR RACE-CONSCIOUS)

	Dependent variable:				
	Black[a]	PHSS[b]	Low-educ parents[c]	women	ENADE score[d]
	(1)	(2)	(3)	(4)	(5)
A: All Programs					
Race Blind (LT_RB [e] × Post [g])	0.000	0.030*	0.011	0.006	-0.105**
	(0.012)	(0.015)	(0.012)	(0.009)	(0.036)
Race Conscious (LT_RC × Post)	0.036***	0.040**	0.035***	0.002	-0.005
	(0.011)	(0.013)	(0.010)	(0.008)	(0.032)
Program FE	yes	yes	yes	yes	yes
Observations	2,012	2,012	2,012	2,050	2,032
Adjusted R^2	0.847	0.788	0.773	0.925	0.630
B: High-Competitive Programs Only					
Race Blind (LT_RB [e] × Post [g])	0.024	0.053*	0.023	0.005	-0.134
	(0.021)	(0.025)	(0.017)	(0.017)	(0.072)
Race Conscious (LT_RC × Post)	0.064***	0.118***	0.036*	-0.007	0.030
	(0.017)	(0.020)	(0.014)	(0.014)	(0.058)
Program FE	yes	yes	yes	yes	yes
Observations	468	468	468	470	470
Adjusted R^2	0.906	0.812	0.789	0.943	0.653

notes: *p<0.05, **p<0.01, ***p<0.001.

In columns (1)-(4), coefficients can be interpreted as absolute percent point (p.p.) changes. E.g., a coefficient of 0.1 indicates an average increase of 10p.p.

The coefficients are interpreted as the average change in each variable for the Late Treatment group if compared to the corresponding Control group. E.g., a coefficient of 0.1 for the Race-Blind group indicates that the variable increased on average 10p.p. more on programs with race-blind policies if compared to the average change in the control group.

For concieness, we ommit the coefficients associated with early treatment programs. Appendix D reports the whole set of coefficients estimated in this model.

[a] Black: refers to the combined group of Pretos and Pardos

[b] PHSS: Public High School Student (all years)

[c] Low-educ parents: none of the student's parents have studied beyond primary education

[d] The score is normalized based on the mean and s.d. of all federal university freshemn from federal univeristies with the same major

[e] LT_RB: Late AAP Adopter with race-blind policies. Programs that had no AAP in 2005-2007, but adopted a race blind policy in 2008-2010

[e] LT_RC: Late AAP Adopter with race-conscious policies. Programs that had no AAP in 2005-2007, but adopted a race-consious policy in 2008-2010

[g] Post: dummy indicating the second cycle of ENADE exams (2008, 2009 and 2010)

These results suggest an overall ineffectiveness of race-blind policies to indirectly increase the enrollment of racial minorities. Although income, type of school and race are strongly interconnected attributes in Brazil, AAPs using high-school type as the sole eligibility criteria have had no significant effects on improving the enrollment of Blacks, at least in the programs and in the period evaluated in our sample. On the other hand, universities that adopted policies with explicit race-conscious criteria significantly increased their shares of Black students. Moreover, in the case of race-conscious policies, we also observed an increase in the enrollment of students whose parents have not completed beyond primary education, indicating that race-conscious AAPs were also more effective in improving the enrollment for of the least wealthy individuals of society.

4.4. Empirical Model Limitations and Possibly Confounding Factors

The main underlying assumption for the validity of our estimates as the causal effect of AAP is that in the absence of the policy implementation, the changes that would occur in the treated group would be equivalent to changes observed in control universities. Therefore, there are two main threats to the validity of our estimates of the effects of AAPs: 1) the existence of pre-treatment trend differences between universities that adopted or not AAPs; 2) unobserved shocks associated with the adoption of AAPs that may have also affected the enrollment of disadvantaged students in each program. In what follows we examine in further detail each of these threats.

4.4.1. Pre-treatment trends

In the case of differences in trends, we could empirically test it in the pre-treatment period if we had at least two observations for each academic program before the adoption of AAP by the treatment group. Therefore, in our setting, such data is only available in the case of the academic majors included in the Group 1 of ENADE. These programs were evaluated in 2004, 2007 and 2010. Therefore, for this group

it is possible to analyze, for each dependent variable, whether paths were parallel between 2004 and 2007 for the Control and the Late Treatment groups, that is, between programs from universities that did not adopt AAP and programs from universities that adopted the policy between 2008 and 2010. To conduct this test, we subset our sample to Group 1 of academic majors and estimate pre-treatment common trends using a model with fully flexible group-specific dynamics as described by Mora & Reggio (2017), which in our setting, is represented by Equation 5 below:

$$y_{pt} = \alpha_p + \left(\beta_{2007} + \gamma_{2007} ET_p + \delta_{2007} LT_p\right) \cdot T_t^{2007} + \left(\beta_{2010} + \gamma_{2010} ET_p + \delta_{2010} LT_p\right) \cdot T_t^{2010} + \varepsilon_{pt} \quad (5)$$

Differently from the baseline pooled model, this estimation includes observations from three different periods, therefore the indicator variables of time-periods are defined as:

$$\begin{aligned} T_t^{2007} &= 1 \quad if \quad t = 2007 \\ T_t^{2007} &= 0 \quad otherwise \\ \\ T_t^{2010} &= 1 \quad if \quad t = 2010 \\ T_t^{2010} &= 0 \quad otherwise \end{aligned} \quad (6)$$

Again, programs from universities that adopted AAP in 2007 are classified as Early Treatment (ET), programs that adopted AAP in 2010 are classified as Late Treatment (LT), and programs without any AAP are classified as Controls.[29] If common trends existed between Late Treatment and Control groups

[29] Within our sample, besides UNB, no other university had adopted AAP by 2004. Therefore, to avoid estimating a set of coefficients based on a single university, we exclude the observations of students from UNB from this analysis.

before the adoption of AAP by the former group, then coefficient δ_{2007} should not be statistically different from zero for none of our dependent variables.

Table 10 reports the point-estimates of δ_{2007} for each of the dependent variables included in our analysis. All estimates are not statistically different from zero, therefore we cannot reject the assumption of common trends between treated and control universities before AAP adoption by the former group. Figure 2 shows the results from this exercise graphically, where the segments between 2004 and 2007 indicate the pre-treatment trends – which are the ones we need to assume are equivalent between LT and Co groups – and the segments from 2007 and 2010 indicate the group specific trends after AAP adoption by the LT group.

TABLE 10: OLS REGRESSION – PRE-TREND DIFFERENCES BETWEEN LATE TREATMENT AND CONTROL GROUPS BEFORE THE ADOPTION OF AAP (GROUP 1 OF ENADE MAJORS)

	Dependent variable:				
	Black[a]	PHSS[b]	Low-educ parents[c]	women	ENADE score[d]
Pre-treatment trend Differences (LT × T^{2007}) [e]	-0.099	-0.025	-0.122	0.011	-0.082
	(0.087)	(0.096)	(0.130)	(0.038)	(0.081)
Program FE	yes	yes	yes	yes	yes
Observations	660	666	564	705	696
Adjusted R^2	0.844	0.753	0.701	0.868	0.385

notes: *p<0.05, **p<0.01, ***p<0.001.

In columns (1)-(4), coefficients can be interpreted as absolute percent point (p.p.) changes. E.g., a coefficient of 0.1 indicates an average increase of 10p.p.

The coefficients indicate trend differences between the Late Treatment and Control Groups before the treatment of the former group. E.g., a coefficient of 0.1 would indicate that, before AAP adotpion, the variable woul be increasing 10p.p. more per cycle on the Late treatment group if compared to the the control group.

For consiseness, we ommit the coefficients for the interactions between 2007, 2010 and ET.

[a] Black: refers to the combined group of Pretos and Pardos

[b] PHSS: Public High School Student (all years)

[c] Low-educ parents: none of the student's parents have studied beyond primary education

[d] The score is normalized based on the mean and s.d. of all federal university freshemn from federal univeristies with the same major

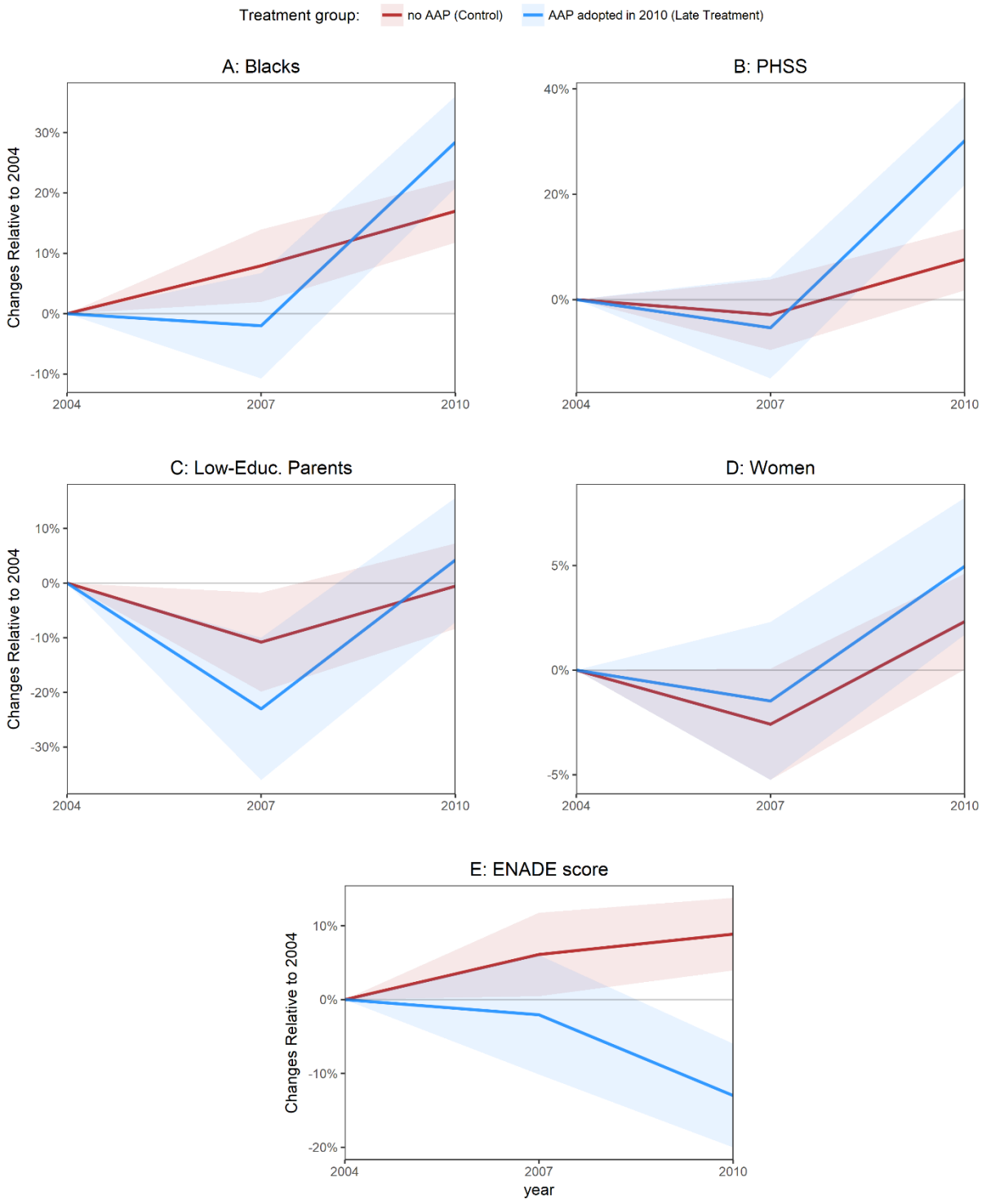

FIGURE 2: OLS REGRESSION RESULTS – TRENDS OF DEPENDENT VARIABLES FOR LATE TREATMENT AND CONTROL GROUPS (GROUP 1 OF ENADE MAJORS)

Although the regression results of interest are not statistically significant, the point estimates are negative for the share of Blacks, PHSS and students with low-education parents. So, if anything, the results from this exercise indicate that the shares of disadvantaged students were actually decreasing in universities that adopted AAPs if compared to the control group. Therefore, these results strongly support the causal interpretation of our main results.

4.4.2. Possibly Contemporaneous Confounding Factors

The second threat to the validity of our estimates is the possibility of unobserved shocks associated with the adoption of AAP by each university that could also affect the selection of disadvantaged students on treated programs. When comparing public universities with respect to the adoption of AAP, Daflon, Júnior, & Campos (2013) find no significant differences in terms of geographical distribution[30] and academic ranking of universities. However, other factors with relevant impacts on the profile of enrolled students could still be correlated with the adoption of AAPs. To address this issue, we test the association between the adoption of AAP and five possibility confounding variables: 1) the expansion of undergraduate positions, 2) the expansion of nearby competing private universities, 3) the growth of regional economic activity, 4) the share of black students graduating from high school, and 5) the share of high school graduates from public high schools. To test if changes in each of these variables were correlated with the adoption of AAPs in the universities evaluated in our study, we constructed a yearly panel of academic programs and estimated the following regression model:

$$\Delta z_{ut} = \phi\, AAP_{ut} + \mu_t + \varepsilon_{ut} \qquad (7)$$

Where Δz_{ut} is the proportional change in variable z_u between years t and $t-1$, that is:

[30] Appendix C shows the map with the location of Brazilian federal universities by AAP treatment status.

$$\Delta z_{ut} = \frac{(z_{ut} - z_{ut-1})}{z_{ut-1}} \quad (8)$$

Moreover, AAP_{ut} is an indicator if university u had adopted an AAP by year t. Finally, μ_t are year fixed effects. If the adoption of AAPs by federal universities were associated with any of the changes in potentially confounding variables z, then coefficient ϕ would capture that relationship. For example, a coefficient of 0.2 would indicate that the adoption of AAP would be associated with an average increase of 20% in the dependent variable.

Additionally, we also explore 3 additional potentially confounding factors that could be associated with the ENADE data sampling in each program: 1) the share of students enrolled in the night-session of each program, and 2) the share of students with missing data from the socioeconomic questionnaire. 3) the cohort size in each program. For these variables, Equation 7 is extended to include Program Fixed Effects as the model is estimated using data at the program level:

$$z_i = \phi\, AAP_{it} + \mu_t + \lambda_p + \varepsilon_i \quad (8)$$

In this case, because we do not observe each program every year, the dependent variables are absolute shares in the case of night-session and missing data. In the case of cohort size, we use the log of the number of students in each program to calculate the dependent variable. So, for the first two variables, the resulting coefficients can be interpreted as the average absolute share change associated with AAP adoption, and in the case of cohort size, the coefficient express the average relative cohort size change.

Results for the estimation of Equations 7 and 8 are shown in Table 11. These results indicate that the adoption of AAPs does not seem to be associated with any of the variables we have included in this analysis. The only significant result is a reduction of approximately 1.5% in the share of Blacks taking ENEM in the states where universities adopted AAPs. Even though the magnitude of the association is

small, the sign of this coefficient is in the opposite direction of a result that would indicate that our main result could be spurious due to this concomitant change. That is, the adoption of AAP does not seem to be associated with an increase in the shares of Black students graduating from secondary education or applying to college. If anything, this result indicates that the coefficients we estimate for the effects of AAPs adoption in the enrollment of Black students could be downward biased.

In conclusion, from the analysis carried in section D1, we do not observe pre-treatment differences in our main dependent variables between universities from the treatment and control groups. Additionally, on section D2, we did not find evidence of any association between the adoption of AAP and variables that could potentially be associated with the selection of disadvantaged students. Both these results support the interpretation of our main coefficients as the causal effect of AAPs in the enrollment of students from disadvantaged groups

TABLE 11: OLS REGRESSION - AAP ADOPTION AND POSSIBLY CONFOUNDING VARIABLES

	Dependent variable:							
	University Level Models					Program Level Models		
	Δstudents	ΔPriv Univ	ΔGDP	ΔPHSS ENEM	ΔBlack ENEM	night session	missing data	cohort size
AAP	0.012	-0.002	-0.007	0.002	-0.015**	0.012	-0.008	0.029
	(0.053)	(0.014)	(0.008)	(0.004)	(0.006)	-0.026	(0.039)	(0.036)
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Program FE						yes	yes	yes
Obs	336	336	336	336	336	2,020	2,020	2,020
Adj R^2	0.086	0.144	0.101	0.459	0.698	0.512	0.075	0.665

notes: *p<0.1, **p<0.05, ***p<0.01.

In the case of models estimated at the University level, the dependent variables are expressed in terms of relative changes to the previous year, so, for example, a coefficient of 0.2 would indicate that the adoption of AAP is associated with an average increase of 20% in that dependent variable

In the case of models estimated at the program level, the variables "night session" and "na data" are absolute shares, so similar to our main empirical models, coefficients indicate absolute share changes, i.e., a coefficient of 0.2 indicates a 20p.p. average increase. Finally, for the "cohort size" variable, we use the log of the number of students in each cohort, so a coefficient of 0.2 would indicate an average increase of approximately 20% on the cohort size associated with AAP adoption.

5. Conclusion

This paper investigated the effects of the adoption of AAPs by Brazilian federal universities. Using a difference-in-differences design, we explored the heterogeneity in the time of policy adoption to identify the effects of AAP on the enrollment of students from disadvantaged groups. Our results indicate that the AAPs adopted in the period we analyzed were particularly effective in improving the enrollment of students from groups explicitly targeted by each policy. Most universities in our sample adopted rules to favor the selection of students who graduated from public high schools or who were self-identified as Blacks, and accordingly, we observed an overall increase in the enrollment of students from those groups.

However, the increase in the enrollment of Blacks was only observed in the academic programs from universities that adopted AAPs with explicit racial criteria. A common argument in the debate about affirmative action is that race-blind policies would be preferred because the interconnected relationship between race and socioeconomic conditions insure that policies targeting socioeconomically deprived individuals would indirectly benefit racial minorities without relying on controversial race-based preferences. However, we have shown that race-blind AAPs have had a negligible effect on the enrollment of Blacks. Meanwhile, race-conscious policies not only were associated with a larger share of admitted Black students, but also had larger impacts on the enrollment of individuals with worse socioeconomic characteristics.

Similar to other results from the international literature, we also observed that the effects of AAPs were larger for more competitive programs, while they were mostly negligible for less-competitive ones. Moreover, we did not find any evidence of differences in the academic performance of students enrolled in programs that adopted AAP nor any differences in their gender composition.

We acknowledge that the main limitation of our study relates to the source of the information we have used to identify the characteristics of students in each program. The demographic data from the ENADE exam is limited because it is self-reported and academic programs are observed only once every three years. However, it is the best available source of information for the set of students enrolled in the

academic programs of Brazilian Federal Universities in the period we analyzed in this paper. Linking the ENADE data with other sources of students' information is a suggested next step for improving the quality and precision of the analysis carried in this paper. Additionally, our analysis is constrained to a single aspect associated with the adoption of AAPs. Further questions on the impacts of these policies in the Brazilian context remain unanswered, including the graduation rates of beneficiaries, the impacts of college access on labor market earnings and the overall effects of the policy on economic inequality.

6. Acknowledgments

We are grateful to Eduardo Rios-Neto, Peter Christensen, Paula Pereda, André Chagas and Sandy Dall´erba for their advice. We also received helpful comments from seminar participants at the University of Illinois International Policy and Development Workshop, the University of São Paulo Regional and Urban Economics Lab (NEREUS-USP), and the Center of Politics and Economics of the Public Sector at Fundação Getúlio Vargas (CEPESP-FGV). Errors remain our own.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

Alon, S., & Malamud, O. (2014). The impact of Israel's class-based affirmative action policy on admission and academic outcomes. *Economics of Education Review*, 123-139.

Aranha, A. V., Pena, C. S., & Ribeiro, S. H. (2012). Programas de inclusão na UFMG: o efeito do bônus e do Reuni nos quatro primeiros anos de vigência - um estudo sobre acesso e permanência. *Educação em Revista*, 317-345.

Arcidiacono, P. (2005). Affirmative Action in Higher Education: How Do Admission and Financial Aid Rules Affect Future Earnings? *Econometrica*, 1477-1524.

Backes, B. (2012). Do Affirmative Action Bans Lower Minority College Enrollment and Attainment? *The Journal of Human Resources*, 435-455.

Bagde, S., Epple, D., & Taylor, L. (2016). Does Affirmative Action Work? Caste, Gender, College Quality, and Academic Success in India. *American Economic Review*, 1495-1521.

Barros, R. P., Foguel, M. N., & Ulyssea, G. (2006). *Desigualdade de Renda no Brasil: uma análise da queda recente.* IPEA.

Bertocchi, G., & Dimico, A. (2014). Slavery, education, and inequality. *European Economic Review*, 197-209.

Bertrand, M., Hanna, R., & Mullainathan, S. (2010). Affirmative action in education: Evidence from engineering college admissions in India. *Journal of Public Economics*, 16-29.

Card, D., & Krueger, A. (2005). Would the Elimination of Affirmative Action Affect Highly Qualified Minority Applicants? Evidence from California and Texas. *Industrial & Labor Relations Review*, 416-434.

Cicalo, A. (2012). *Urban Encounters: Affirmative Action and Black Identities in Brazil.* New York, NY: Palgrave Macmillan.

Cicalò, G. A. (2008). What Do We Know About Quotas? Data and Considerations About the Implementation of the Quota System in the State University of Rio de Janeiro (UERJ). *universitas humanística*, 261-278.

Corbucci, P. R., Kubota, L. C., & Meira, A. P. (2016). Evolução da educação superior privada no Brasil: da Reforma Universitária de 1968 à década de 2010. In P. A. Nascimento, *Radar: tecnologia, produção e comércio exterior* (pp. 7-12). Brasília: IPEA.

Daflon, V. T., Júnior, J. F., & Campos, L. A. (2013). Race-based affirmative actions in Brazilian public higher education: an analytical overview. *Cadernos de Pesquisa*, 303-327.

Darity, W., Deshpande, A., & Weisskopf, T. (2011). Who Is Eligible? Should Affirmative Action be Group- or Class-Based? *American Journal of Economics and Sociology*, 238-268.

Epple, D., Romano, R., & Sieg, H. (2008). Diversity and affirmative action in higher education. *Journal of Public Economic Theory*, 475-501.

Estevan, F., Gall, T., & Morin, L.-P. (2016). Redistribution without distortion: Evidence from an affirmative action program at a large Brazilian university. *FEA-USP Department of Economics Working Papers*.

Estevan, F., Gall, T., & Morin, L.-P. (2016). *Redistribution without distortion: Evidence from an affirmative action program at a large Brazilian university.* São Paulo: Department of Economics, FEA-USP. Working Paper Nº 2016-07.

Ferreira, S. G., & Veloso, F. A. (2006). Intergenerational Mobility of Wages in Brazil. *Brazilian Review of Econometrics*, 181-211.

Francis, A. M., & Tannuri-Pianto, M. (2011). Using Brazil's Racial Continuum to Examine the Short-Term Effects of Affirmative Action in Higher Education. *The Journal of Human Resources*, 754-784.

Frisancho, V., & Krishna, K. (2016). Affirmative action in higher education in India: targeting, catch up, and mismatch. *Higher Education*, 611-649.

Fujiwara, T., Laudares, H., & Caicedo, F. V. (2017). Tordesillas, Slavery and the Origins of Brazilian Inequality. *Working Paper*.

G1. (2007, 05 29). *globo.com*. Retrieved from G1: http://g1.globo.com/Noticias/Vestibular/0,,MUL43786-5604-619,00.html

Google. (2009, 08 25). *Googleblog*. Retrieved from https://googleblog.blogspot.com.br/2009/08/bright-side-of-sitting-in-traffic.html

Hill, A. J. (2017). State affirmative action bans and STEM degree completions. *Economics of Education Review*, 31-40.

Hinrichs, P. (2012). The Effects of Affirmative Action Bans on College Enrollment, Educational Attainment, and the Demographic Composition of Universities. *The Review of Economics and Statistics*, 712-722.

Hinrichs, P. (2014). Affirmative action bans and college graduation rates. *Economics of Education Review*, 43-52.

Holzer, H. J., & Neumark, D. (2006). Affirmative action: what do we know? *Policy Retrospectives* , 463-490.

INEP. (2005). *Censo da Educação Superior 2004. Resumo Técnico.* Brasília: MInistério da Educação.

Kapor, A. (2016). Distributional Effects of Race-Blind Affirmative Action. *Working Paper*, 1-100.

Laskar, M. H. (2010). Rethinking Reservation in Higher Education in India. *ILI Law Review*, 25-53.

Long, M. C. (2004). Race and college admissions: An alternative to affirmative action? *The Review of Economics and Statistics*, 1020-1033.

Lopes, A. D. (2016). Affirmative action in Brazil: how students' field of study choice reproduces social inequalities. *Studies in Higher Education*, 1-17.

Mora, R., & Reggio, I. (2017). Alternative diff-in-diffs estimators with several pre-treatment periods. *Econometric Reviews*, Accepted Manuscript.

OECD. (2016). *Education at a Glance 2016: OECD Indicators.* Paris: OECD Publishing.

Soares, R., Assunção, J., & Goulart, T. (2012). A note on slavery and the roots of inequality. *Journal of Comparative Economics*, 565-580.

World Bank. (2017, 1 14). *Brazil overview*. Retrieved from The World Bank: http://www.worldbank.org/en/country/brazil/overview#1

World Bank. (2017, 02 02). *World DataBank*. Retrieved from The World Bank: http://databank.worldbank.org/data/reports.aspx?source=2&series=SI.POV.GINI&country=#

APPENDIX A: DETAILS OF AAP ADOPTION IN BRAZILIAN FEDERAL UNIVERSITY

TABLE A1: AAPS ADOPTED BY BRAZILIAN FEDERAL UNIVERSITIES (2004-2013)

University	Type of AAP	Value	Eligibilibity Criteria	Year of implementation	Description
UFABC	quotas	50%	phs blacks on phs indigenous on phs	2007	Starting in 2007 (when the university was created), UFABC reserved 50% of its positions to students who graduated from public secondary schools. Out of this total, 27.2% (13.6% of total) was reserved for black students and 0.4% (0.2% of total) to indigenous.
UFAC	none			2013	Until 2012 UFAC did not have any type of AAP in their selection process.
UFAL	quotas	20%	blacks black women	2005	UFAL reserved 20% of its positions to students who self-declare as black. Starting in 2006, 60% of this quota was restricted to black women.
UFAM	none			2013	Until 2012 UFAM did not have any type of AAP in their selection process.
UFBA	quotas	45%	phs blacks on phs indigenous on phs	2005	Starting in 2005, UFBA started a program of quotas where 36.55% of its positions were reserved to black students from public high schools, 6.45% were reserved to all public high school students and 2 % were reserved to indigenous.
UFC	none			2013	Until 2012 UFC did not have any type of AA police in their selection process
UFCG	none				Until 2012 UFCG did not have any type of AA police in their selection process
UFES	quotas	40 - 45%	phs	2008	Starting in 2008, UFES reserved 40% of its positions to students who did 4 years of primary education and all secondary education on public high schools. This share was increased to 45% in 2009 and was kept at that level until 2012.
UFF	bonus	10-20%	phs	2008	UFF granted a 10% bonus on the exam score of students who graduated from public secondary education. The bonus was increased to 20% in 2012.
UFG	quotas	20%	phs blacks on phs	2005	UFG reserved 10% of its positions to public high school students and additional 10% to black students from public high schools.
UFJF	quotas	30 - 50%	phs blacks on phs	2006	Starting in 2006, UFJF reserved 30% of its positions to students from public high school. Out of this share, 50% (25% of total) was reserved for black students. The total share was increase to 40% in 2007 and 50% in 2008, and remained at that level until 2012.
UFLA	none			2013	Until 2012 UFLA did not have any type of AA police in their selection process.
UFMA	quotas	50%	phs blacks blacks on phs	2007	Starting in 2007, UFMA reserves 25% of its positions to students from public high school and 25% to black students regardless of their type of high school. In 2009 the share reserved for black students was restricted to students who completed secondary education on public high schools. The policy remained the same until 2012.
UFMG	bonus	10 - 15%	phs blacks on phs	2009	UFMG granted a bonus of 10% to the score of students who completed all secondary education and the last 4 years of primary education on public high schools. Additionally, the students who satisfied the above criteria and were self-declared as black, would gain a total bonus of 15%.

TABLE A1: AAPS ADOPTED BY BRAZILIAN FEDERAL UNIVERSITIES (2004-2013) – (CONTINUATION)

University	Type of AAP	Value	Eligibilibity Criteria	Year of implementation	Description
UFMS	none			2013	Until 2012 UFMS did not have any type of AAP in their selection process.
UFSM	quotas	36-40%	phs blacks indigenous handicapped	2008	Starting in 2008, UFSM reserved its positions according to the following system: 11% for black students, 5% for handicapped, 20% for public schools and up to 8 new positions for indigenous. The system remained roughly the same until 2012 with a yearly increment of 1% in the share reserved for black students.
UFMT	quotas	50%	phs blacks on phs	2012	Starting in 2012, UFMT created a system of quotas where 50% of its positions were reserved for public high school students. Out of this total, 40% (20% of total) will be reserved to black candidates.
UFOP	quotas	30%	phs	2009	Starting in the second semester of 2008, UFOP started reserving 30% of its positions to students who completed all secondary education on public schools.
UFPA	quotas	50%	phs blacks on phs	2006	The policy at UFPA reserved 50% of its positions to students who completed all secondary education on public high schools. 40% of this share (20% of total) was reserved for students who declared themselves as black (*negro*). In both cases, students had to opt in.
UFPB	quotas	25 - 30%	phs	2006	Starting in 2006, UFPB reserved 25% of its positions to students from public secondary schools. In 2012 this share was increased to 30%. Official notices for those exams could not be found.
UFPE	bonus	10%	phs	2005	Starting in 2005, UFPE granted a bonus of 10% on the score of students who completed the whole secondary education on public high schools on the surrounding areas of each of its campi. The policy remained mostly the same until 2012 with some changes about the geographical areas in each vestibular. Formal information such as notices and exam calls is really hard to find for UFPE.
UFPEL	none			2013	Until 2012, UFPEL did not have any type of AAP in their selection process.
UFPI	quotas	5 - 20%	phs blacks on phs	2007	In 2007, UFPI reserved 5% of its positions to students who completed all primary and secondary education on public schools. In 2008 this share was increased to 20% and remained like that until 2012.
UFPR	quotas	40%	phs blacks	2005	Starting in 2005, UFPR started a program of quotas where 20% of its positions were reserved to students from public high schools (with up to one year studied on private schools) and 20% were reserved to black students. The policy remained mostly the same until 2012, except for some changes in the required number of years studied in public schools. For the process of 2012 students were required to have studied all secondary and primary education to be eligible to the 20% of positions reserved for public schools.
UFRB	quotas	45%	phs blacks on phs indigenous on phs	2006	Founded in 2006, UFRB had its entrance exams carried by UFBA until 2010, hence it followed the same system of quotas of UFBA. After that, they continued following the same system of quotas of UFBA.

TABLE A1: AAPS ADOPTED BY BRAZILIAN FEDERAL UNIVERSITIES (2004-2013) – (CONTINUATION)

University	Type of AAP	Value	Eligibilibity Criteria	Year of implementation	Description
UFRGS	quotas	30%	phs blacks on phs	2008	UFRGS reserved 30% of its positions to students who completed the whole secondary and primary education on public high schools. Addionally, 50% of this positions (15% of total), were reserved to students who self-declared as black.
UFRN	bonus	by program	phs	2006	Since 2006 grants a score bonus on the admission exam for students from public high schools from that state. The bonus is individually defined for each academic program.
UFRPE	bonus	10%	phs	2005	Starting in 2005, UFRPE granted a bonus of 10% on the score of students who completed the whole secondary education on public high schools of the countryside of the state. The policy remained mostly the same until 2012 with some changes about the geographical areas in each vestibular. Formal information from official notices were not found.
UFRR	none			2013	Until 2012 UFRR did not have any type of AA police in their selection process.
UFRRJ	bonus	10%	phs	2010	Starting in 2010, UFRRJ started giving a bonus of 10% to students who completed the whole secondary education on public schools.
UFS	quotas	50%	phs blacks on phs	2010	Starting in 2010, UFS started selecting 50% of its student from individuals who completed the whole secondary education and at least 4 years of primary education on public schools. Out of this share, 70% (35% of total) is reserved to students who self declare as black.
UFSC	quotas	30%	phs blacks on phs	2008	UFSC program of quotas had 20% of its positions were reserved to public high school students and 10% additional positions were reserved to black students from public high schools
UFSCAR	quotas	20 - 40%	phs blacks on phs	2008	Starting in 2008, UFSCAR started a program of quotas where 20% of its positions were reserved for students who studied the whole secondary education on public schools. Out of this share, 35% (7% of total) was reserved to black students from public high schools. In 2011 the total share was increased from 20% to 40%. The policy remained the same until 2012. Official exam calls for the period were not found.
UFSJ	quotas	50%	phs blacks on phs indigenous on phs	2010	Starting in 2010, UFSJ started reserving 50% of its positions to tstudents who completed primary and secondary education on public schools. Within this quota, a share corresponding to the proportion of each race in the state of Minas Gerais was reserved for each race. Therefore, an additional quota of 46% (23% of total) was reserved for black, brown and indigenous students from public schools.
UFT	quotas	5%	indigenous	2005	UFT reserved 5% of its positions to indigenous individuals. Until 2013, no other AA policy was introduced
UFTM	bonus	10%	phs	2009	Starting in the second half of 2009, UFTM started granting a bonus of 10% to students who completed 4 years of primary education and all secondary education on public schools.

TABLE A1: AAPS ADOPTED BY BRAZILIAN FEDERAL UNIVERSITIES (2004-2013) – (CONTINUATION)

University	Type of AAP	Value	Eligibilibity Criteria	Year of implementation	Description
UFU	quotas	25 - 50%	phs	2011	Starting in 2008, UFU created a specific vestibular for students from public high schools who studied at least 4 years of primary education on public schools. This vestibular would consist of 3 exams taken once a year during secondary education. Therefore, the first students selected through this process would enter university in 2011. The share of positions selected through this process ranged from 25%-50%. The system faced a series of judicial disputes and different court orders had varying verdicts about the validity of reservations.
UFV	none			2013	Until 2012 UFV did not have any type of AAP in their selection process.
UnB	quotas	20%	blacks	2004	UnB was the first federal university to start a program of quotas in Brazil. Starting in the second semester of 2004, UnB reserved 20% of regular vestibular positions to black students.
Unifal	none			2013	Until 2012 Unifal did not have any type of AA police in their selection process.
UNIFAP	none			2013	Until 2012 UNIFAP did not have any type of AAP in their selection process.
Unifei	none			2013	Until 2012 Unifei did not have any type of AAP in their selection process.
Unifesp	quotas	10%	blacks on phs indigenous on phs	2005	Unifesp system of quotas reserved 10% to black or indigenous students who completed all secondary education on public schools
Unirio	none			2013	Until 2012 Unirio did not have any type of AAP in their selection process.
Univasf	quotas	50%	phs	2010	In 2010, Univasf started reserving 50% of its positions to students from public high schools.
URG (FURG)	bonus	6 - 10%	phs blacks on phs	2010	Starting with the exam of 2010, FURG granted a bonus of 6% to the score of students who completed at least 2 years of their secondary education on public high schools. Additionally, the students who satisfied the above criteria and were self-declared as black, would gain an additional of 3%. The system was slightly changed in 2011 with the following system of bonus: 4% for students from public school and additional 6% for black students from public high schools. The system was the same in 2012.
UTFPR	quotas	50%	phs	2008	UFTPR reserved 50% of its positions to students who completed the whole secondary education on public high schools.

APPENDIX B: STUDENTS BY UNIVERSITY, YEAR AND ENADE GROUP OF ACADEMIC MAJORS

TABLE B1: SAMPLE OF FRESHMEN STUDENTS BY FEDERAL UNIVERSITY AND ENADE ACADEMIC GROUP (2004-2010)

University	Group 1			Group 2		Group 3		Total
	2004	2007	2010	2005	2008	2006	2009	
UFRJ	387	467	1,115	1,214	2,205	674	1,468	7,530
UFPE	379	508	854	1,069	1,453	860	2,090	7,213
UFF	347	478	1,327	1,197	1,792	770	1,213	7,124
UFPA	254	435	852	1,557	1,904	742	1,116	6,860
UFRGS	466	388	946	862	1,471	594	1,581	6,308
UFBA	265	520	1,181	1,183	1,390	677	990	6,206
UFSC	325	323	769	1,124	1,371	600	1,628	6,140
UFM G	464	436	1,284	903	1,301	510	1,240	6,138
UFM T	532	534	1,001	1,237	1,337	398	980	6,019
UFPI	277	388	1,189	443	1,746	310	1,654	6,007
UFG	443	555	1,077	882	1,477	522	893	5,849
UFRN	343	338	906	975	1,354	562	1,152	5,630
UFAM	268	468	974	693	1,485	383	1,220	5,491
UFPB	427	413	952	664	1,177	615	1,216	5,464
UnB	325	354	694	969	1,017	602	1,302	5,263
UFPR	377	484	1,080	649	997	491	1,035	5,113
UFAL	397	606	939	500	1,337	252	886	4,917
UFS	360	305	732	691	1,385	351	740	4,564
UFES	268	340	674	460	982	465	1,308	4,497
UFSM	378	610	864	651	875	336	748	4,462
UFM S	285	251	435	788	934	536	1,019	4,248
UFC	258	282	615	824	1,081	311	810	4,181
UFU	246	236	575	462	1,346	259	770	3,894
UFPEL	267	400	928	445	979	168	349	3,536
UFM A	115	276	437	521	895	433	634	3,311
UFCG	73	107	529	734	1,159	191	482	3,275
UFV	300	281	496	640	796	210	423	3,146
UFJF	264	202	497	472	764	277	521	2,997
UFRPE	182	469	826	375	794	98	131	2,875
UFT	145	146	299	557	944	239	420	2,750
UFRRJ	217	215	305	268	413	225	967	2,610
Unirio	136	168	436	208	286	465	641	2,340
UFSCar	149	152	211	507	1,022	94	139	2,274
URG	62	69	95	558	593	179	498	2,054
UFAC	178	153	304	361	785	97	138	2,016
Ufop	97	66	140	536	804	149	218	2,010
Unir	31	70	115	320	571	294	341	1,742
UTFPR	31	113	164	159	652	71	88	1,278
UFRR	60	62	117	198	312	208	313	1,270
UFSJ	31	25	0	307	497	143	252	1,255
Unifesp	117	328	690	0	0	31	49	1,215
Ufla	140	128	408	197	245	28	48	1,194
Univasf	0	228	273	88	235	79	178	1,081
UNIFAP	31	34	53	228	411	90	87	934
Unifal	113	129	236	38	119	0	0	635
UFTM	51	144	349	0	0	10	0	554
Unifei	0	0	0	159	301	30	40	530

APPENDIX C: REGIONAL DISTRIBUTION OF FEDERAL UNIVERSITIES BY AAP ADOPTION STATUS

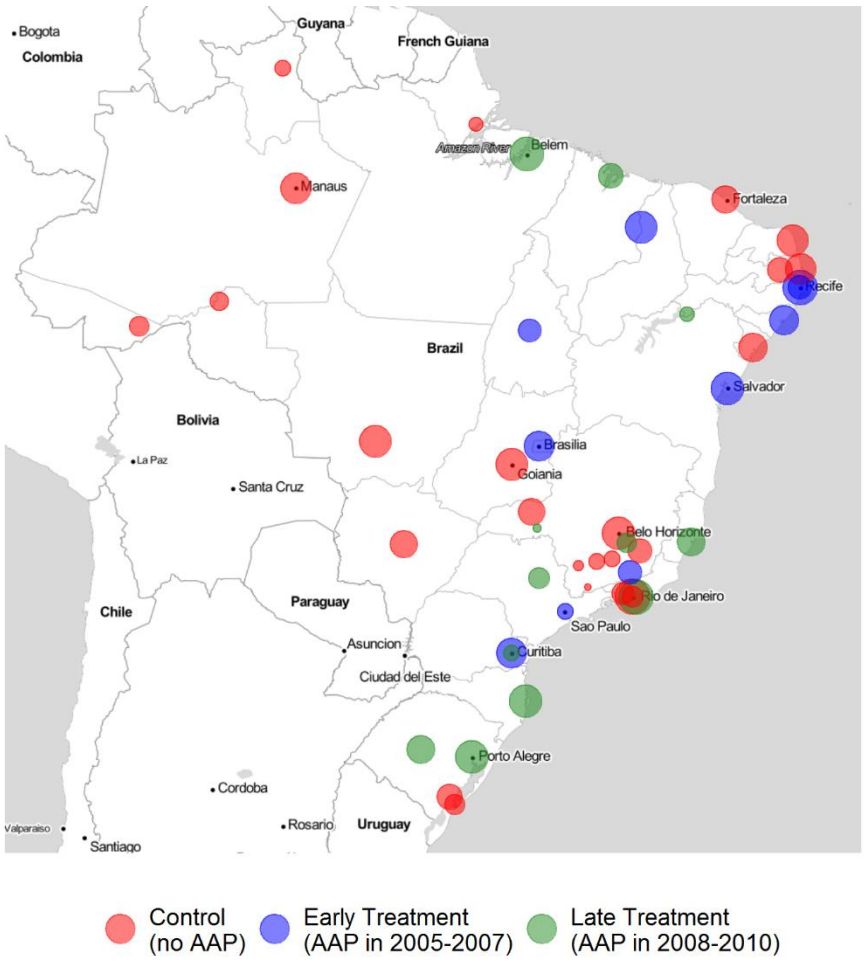

FIGURE C1: BRAZILIAN FEDERAL UNIVERSITIES BY YEAR OF AAP ADOPTION (2005-2010)

APPENDIX D: FULL SET OF RESULTS FROM OUR REGRESSION ESTIMATIONS

TABLE D1: REGRESSION RESULTS FOR COMPETITIVENESS HETEROGENEITY MODEL

	Dependent variable:				
	Black[a]	PHSS[b]	Low-educ parents[c]	women	ENADE score[d]
LT × Post × C_{low}	0.013	0.013	0.023	-0.021	0.011
	(0.025)	(0.029)	(0.024)	(0.017)	(0.068)
LT × Post × C_{med}	0.007	0.006	0.008	0.018	-0.117*
	(0.019)	(0.022)	(0.018)	(0.013)	(0.053)
LT × Post × C_{hig}	0.051**	0.098***	0.032	-0.003	-0.023
	(0.018)	(0.021)	(0.017)	(0.013)	(0.050)
ET × Post × C_{low}	0.052*	0.052*	0.048*	-0.006	0.095
	(0.022)	(0.025)	(0.021)	(0.015)	(0.061)
ET × Post × C_{med}	0.014	0.038	0.013	0.008	-0.059
	(0.021)	(0.024)	(0.020)	(0.015)	(0.058)
ET × Post × C_{hig}	0.037	0.125***	0.031	-0.019	0.132*
	(0.020)	(0.023)	(0.019)	(0.014)	(0.056)
Post × C_{low}	0.008	0.057***	-0.013	0.028***	-0.028
	(0.011)	(0.013)	(0.011)	(0.008)	(0.032)
Post × C_{med}	0.019	0.050**	0.010	0.021*	0.053
	(0.013)	(0.015)	(0.012)	(0.009)	(0.037)
Post × C_{hig}	-0.002	-0.035*	-0.024	0.021*	-0.002
	(0.014)	(0.016)	(0.013)	(0.010)	(0.039)
Program FE	yes	yes	yes	yes	yes
Obs	1,464	1,464	1,464	1,490	1,478
Adj R^2	0.847	0.804	0.779	0.933	0.633

notes: *p<0.05, **p<0.01, ***p<0.001.

In columns (1)-(4), coefficients can be interpreted as absolute percent point (p.p.) changes. E.g., a coefficient of 0.1 indicates an average increase of 10p.p.

[a] Black: refers to the combined group of Pretos and Pardos

[b] PHSS: Public High School Student (all years)

[c] Low-educ parents: none of the student's parents have studied beyond primary education

[d] The score is normalized based on the mean and s.d. of all federal university freshemn from federal univeristies with the same major

[e] LT: Late AAP Adopter. Programs that had no AAP in 2005-2007, but adopted it in 2008-2010

[f] ET: Early AAP Adopter. Programs that adopted AAP in 2005-2007

[g] Post: dummy indicating the second cycle of ENADE exams (2008, 2009 and 2010)

[h] Program competitivenss was defined based on the minimum SISU score of 2016. For details, see Figure 1.

TABLE D2: REGRESSION RESULTS FOR RACE-BLIND RACE-CONSCIOUS HETEROGENEITY MODEL

	Dependent variable:				
	Black[a]	PHSS[b]	Low-educ parents[c]	women	ENADE score[d]
	(1)	(2)	(3)	(4)	(5)
A: All Programs					
Race Blind - Late Treatment (RB_LT [e] × Post [f])	0.000	0.030*	0.011	0.006	-0.105**
	(0.012)	(0.015)	(0.012)	(0.009)	(0.036)
Race Consious - Late Treatment (RC_LT × Post)	0.036***	0.040**	0.035***	0.002	-0.005
	(0.011)	(0.013)	(0.010)	(0.008)	(0.032)
Race Blind - Early Treatment (RB_ET × Post)	0.017	0.039*	0.047**	0.020	0.046
	(0.016)	(0.019)	(0.016)	(0.012)	(0.047)
Race Consious - Early Treatment (RC_ET × Post)	0.023*	0.048***	0.013	-0.021*	0.113***
	(0.011)	(0.013)	(0.011)	(0.008)	(0.033)
Post	0.013*	0.035***	-0.006	0.023***	0.007
	(0.006)	(0.007)	(0.006)	(0.004)	(0.018)
Program FE	yes	yes	yes	yes	yes
Observations	2,012	2,012	2,012	2,050	2,032
Adjusted R^2	0.847	0.788	0.773	0.925	0.630
B: High-Competitive Programs Only					
Race Blind - Late Treatment (RB_LT [e] × Post [f])	0.024	0.053*	0.023	0.005	-0.134
	(0.021)	(0.025)	(0.017)	(0.017)	(0.072)
Race Consious - Late Treatment (RC_LT × Post)	0.064***	0.118***	0.036*	-0.007	0.030
	(0.017)	(0.020)	(0.014)	(0.014)	(0.058)
Race Blind - Early Treatment (RB_ET × Post)	0.006	0.025	0.037	0.006	0.129
	(0.026)	(0.031)	(0.022)	(0.021)	(0.090)
Race Consious - Early Treatment (RC_ET × Post)	0.049**	0.164***	0.028	-0.029	0.133*
	(0.019)	(0.022)	(0.015)	(0.015)	(0.065)
Post	-0.002	-0.035*	-0.024*	0.021*	-0.002
	(0.012)	(0.014)	(0.010)	(0.010)	(0.041)
Program FE	yes	yes	yes	yes	yes
Observations	468	468	468	470	470
Adjusted R^2	0.906	0.812	0.789	0.943	0.653

notes: *p<0.05, **p<0.01, ***p<0.001.

In columns (1)-(4), coefficients can be interpreted as relative changes. E.g., a coefficient of 0.5 indicates a relative increase of 50%. In colum (5) the coefficients indicate changes in terms of test score standard deviations.

[a] Black: refers to the combined group of Pretos and Pardos

[b] PHSS: Public High School Student (all years)

[c] Low-educ parents: none of the student's parents have studied beyond primary education

[d] The score is normalized based on the mean and s.d. of all federal university freshemn from federal univeristies with the same major

[e] Late AAP Adopter: Programs that had no AAP in 2005-2007, but adopted it in 2008-2010

[f] Early AAP Adopter: Programs that adopted AAP in 2005-2007

[g] Race Blind: AAPs without any race specific eligibility criteria. In all of or cases eligibility was granted to PHSS

[h] Race Conscious: AAPs with race specific eligibility criteria. Either exclusive or combined with PHSS status