

# The Paradox of HBCU Graduation Rates

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## Abstract

This paper examines the propensity of African-American students to graduate from Historically Black Colleges and Universities (HBCUs). We take care in developing a control group of institutions from which to compare HBCU success. Using IPEDS data from 2004 to 2016, the results suggest that despite accepting more students who are at risk of not graduating, measured by lower SAT scores or the increased amounts of Pell Grant monies, HBCUs have a higher graduation rate for African-American students than their peers. We then show that gender, major choice nor financial considerations help explain this persistent difference.

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## **INTRODUCTION**

During the 2015-2016 academic year, historically black colleges and universities (HBCUs) served over 200,000 full-time students. For that academic year, the average overall 6-year undergraduate graduation rate for HBCUs was just over 30 percent while non-HBCU institutions experienced an average overall graduation rate of nearly 55 percent. A similar gap appears when we focus solely on the graduation rate of African-American students. In fact, Figure 1 shows that this difference has not only persisted over time, but is also getting worse. This figure is particularly astounding when one considers that the literature (e.g. Hamrick et al, 2004; Ryan, 2004) often finds a positive effect of HBCUs on graduation rates.

This paper sets out to understand this apparent paradox. In order to do so, we recognize that Figure 1 may not be the proper comparison; hence we work to identify the correct comparison group with which the graduation rate of HBCUs should be compared. Ideally, such a comparison group would be observationally similar to HBCUs but without the HBCU designation. To do so, we utilize a set of control variables in a linear regression to condition the graduation rate difference across institutions. We then go one step further and implement coarsened exact matching (CEM) to pare the sample to only include similar institutions, based on variables including student preparedness, institution finances and student body characteristics.

Doing this with data from the Integrated Postsecondary Education Data System (IPEDS) from 2004 thru 2016 suggests that HBCUs have higher graduation rates for African-American undergraduates when compared to similar institutions. We find that African-American students attending HBCUs are up to 25 percent more likely to graduate than African-American students attending a similar non-HBCU. The evidence suggests that while HBCUs may underperform in the universe of higher education as seen in Figure 1, they outperform once the proper comparison is made, especially among those institutions with more students coming from low socioeconomic backgrounds and/or having poor college preparedness.

## **A QUICK PRIMER ON HBCUs**

HBCUs are institutions created prior to the Civil Rights Act of 1964 whose primary purpose was to serve the African-American community. HBCUs were given the HBCU

designation as a result of the Higher Education Act of 1965. Of the 101 HBCUs identified in 2016, 90 are considered four-year institutions. Of these, three are theological seminaries, and two do not offer undergraduate degrees or certificates. Thus, the universe of HBCUs for the purposes of this study is 85 institutions, although that number can fluctuate year to year given data reporting constraints.

Figure 2 shows the geographic location of these 85 HBCUs within the United States. While HBCUs can be found in 21 states plus the US Virgin Islands, most of them are clustered in the Southeastern and Mid-Atlantic regions of the US. While Alabama contains the most HBCUs in the country with 15, many are only 2-year institutions. Hence in our data, North Carolina is considered to have the most 4-year HBCUs with 10.

The literature on HBCUs is vast and spans several dimensions, including the choice to enroll at an HBCU (e.g. McDonough et al., 1997; Sissoko and Shiau, 2005), the social environment at HBCUs (e.g. Allen, 1992), preparation of students at HBCUs (e.g. McDonough et al., 1997; Kim, 2002), major choice of students at an HBCU (e.g. Owens et al 2012, Perna et al. 2009), the creation of African-American doctoral students (e.g. Solorzano, 1995) and labor market outcomes (e.g. Strayhorn, 2008, 2017). The literature on graduation rates, however, is quite mixed.

Kim and Conrad (2006) use student data from 1985 and 1994 and find no differences in degree from attainment for African-American students attending HBCUs. They found that pre-college preparedness (as measured via high school GPA and SAT scores) were most influential in determining degree attainment. They also found that institutional spending had no correlation.

Fryer and Greenstone (2010) examine three data sources to compare both labor market outcomes and graduation rates of African-Americans who attend HBCUs rather than primarily white institutions (PWIs). The paper focuses on two decades, the 1970s and 1990s; the primary result shows the 1970s wage premium for HBCU graduates disappears by the 1990s. This finding is puzzling, but the authors provide some support that the PWIs are improving their effectiveness in educating African-American students. The authors also show other factors of success; importantly for our study, they find competing effects for graduation rates. Two of the datasets which are nationally representative show an increased propensity to graduate with a bachelor's degree for students attending an HBCU; however, the final dataset which only

examines four elite HBCUs show a negative effect on graduation rates. This may signal the existence of significant variation across HBCUs in their effect on graduation rates.

More recently, Flores and Park (2014) examine administrative student-level data from Texas for minority serving institutions (both HBCUs and Hispanic-Serving Institutions). The authors use detailed data on three cohorts, 1997, 2000, and 2002 to statistically match similar students and control for institutional capacity. The authors find that once the treated and control groups are balanced, there does not exist a difference in graduation rates across institutional type. The authors do find differing effects across cohorts for African-Americans attending HBCUs; the results seem to suggest an improvement in HBCU graduation rates over their sample period.

Several papers have indirectly examined HBCUs as an influence on graduation rates. Ryan (2004) uses IPEDS data to measure the relationship between institutional expenditures and degree attainment. He finds a positive and significant effect for academic support and instructional spending on graduation rates. Though not the focus of the paper, the author does show a significant positive impact on graduation rates for HBCUs. Likewise, Hamrick et al. (2004) examine statistical links between institutional type, selectivity, and instructional and student affairs expenditures on graduation rates. The study also provides statistical evidence of a positive effect of HBCU status on degree attainment.

While not HBCU-specific, there is a separate literature focusing on the role of socioeconomic status (SES) on graduation. Allen (1992) illustrates how African-American students at HBCUs had lower SES than African-American students at PWI's. Terenzini, Cabrera and Bernal (2001) demonstrate that low SES students are more likely to be members of an underrepresented racial group and have more risk factors that prevent them from completing a degree, a finding that is echoed by Gladieux and Swail (1998). Finally, Titus (2006) shows that low SES students tend to enroll in institutions with lower levels of financial resources. This branch of literature suggests that studying HBCU graduation rates must be done in conjunction with understanding the SES status of the student body.

All of these papers, in addition to the larger literature, show an interest in the impact HBCUs have on African-American students. We build upon and improve the literature in several key ways. First, we focus on graduation rates at the institutional as opposed to the student level. Administrative student-level data is often incredibly detailed, but it is hard to compile for the

entire country, making it difficult to apply localized results to the nation as a whole. We use the institutions as our unit of observation and attempt to include the entire population of bachelor degree granting institutions (at least those with students accepting federal aid monies). Second, we are careful to match each HBCU institution with statistically similar non-HBCU institutions to create a better balance; this is similar to the matching done in the student-level papers above. Third, we look for a mechanism to explain the differences across institutions; we examine gender difference, major choice distribution, and financial impacts. Finally, we use recent data. The similar studies we reference are all almost 20 years old in terms of data. We use a yearly panel dataset from 2004 to 2016<sup>1</sup>.

## **WORKING WITH IPEDS**

We utilize data from the Integrated Postsecondary Education Data System (IPEDS), which is the main postsecondary education data collection program for the National Center for Education Statistics (NCES). IPEDS consists of numerous surveys of all institutions of higher education who participate in federal student financial aid programs. Surveys include data on institutional characteristics, admissions, enrollment, graduation, faculty and staff, finances, and financial aid, among others.

Our data spans 2004-2016. 2004 is the year in which public institutions were required to switch from FASB (Financial Accounting Standards Board) to GASB (Governmental Accounting Standards Board) accounting standards; as we describe below this results in financial data prior to 2004 not being comparable. 2004 has the added advantage of being a few years prior to the Great Recession.

We limit our data to those institutions that reported data for at least one year and are primarily degree granting 4-year public or private not for profit institutions. This eliminated theological seminaries, colleges that primarily give 2 year associates degrees, and for-profit institutions. IPEDS also has a variable indicating whether or not a school is considered a HBCU; hence any school who had this variable coded as missing was also dropped.

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<sup>1</sup> When we mention the year 2004, we mean the academic year 2003-04. We use this convention throughout the paper.

The remaining institutions formed our unbalanced panel of 1976 institutions comprising 18925 observations. This results in a total of 1175 HBCU observations, representing 5.46% of our total observations.

### *Specific IPEDS Variables*

#### *a. Finance Data*

Our finance variables originate from two separate IPEDS surveys: the Financial Accounting Standards Board (FASB, or F2 form) and the Governmental Accounting Standards Board (GASB, or F1 form), which private and public institutions fill out respectively. Thus, in an effort to compare the finances of both private and public institutions, we created a crosswalk for specific variables of interest, including Pell grants, instructional and institutional expenditures (focusing on instructional spending, academic support, and student services) and beginning and end of year valuation of the endowment, that allowed us to compare values across years.<sup>2</sup> All expenditure variables were divided by full time equivalent (FTE) students for ease of comparison.

#### *b. SAT Scores*

SAT math and verbal scores at both the 25<sup>th</sup> and 75<sup>th</sup> percentiles of the incoming class were utilized as a proxy for student preparedness.<sup>3</sup> Over two-thirds of our sample institutions reported scores at least once during the timespan. Of the remaining institutions with no SAT values recorded at any point, we found that 90% of the HBCUs and 73% of non-HBCUs in this group did not require SAT scores for admission during our timeframe. This suggests that

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<sup>2</sup> Our crosswalk is available upon request. IPEDS cautions against comparing coarse categories such as federal revenues as the components of these categories varies greatly between FASB and GASB standards. We chose sufficiently specific components to avoid these accounting concerns. Additionally, though functional expenditure categories remain relatively intact over time, private institutions reporting under FASB rules will have a higher value as operations and maintenance of plant (OMP) are allocated across specific functions. Under GASB, OMP is its own separate category.

<sup>3</sup> We recognize there is a long literature (e.g. Freedle 2003; Rothstein, 2004; Santelices and Wilson, 2010) concerned about the potential for bias in the SAT and its impact on predicting college performance. Our choices in measuring preparedness within the IPEDS, however, are limited.

institutions with missing SAT data during the entire time period were likely to lack an SAT requirement, and we coded them as such.

*c. Graduation Rates*

Our variable of interest is the 6-year graduation rate of African-American students. The IPEDS Graduation Rate (GR) survey groups students into sets of entering and graduating cohorts based upon numerous characteristics, including type of degree, length of degree, and race. We limited our data to the Bachelor's degree seeking 4-year program cohort (cohort=2 in IPEDS) and focused solely on the entering adjusted cohort (chrtstat=12 in IPEDS) and total completers of a 4-year bachelor's degree (chrtstat=16 in IPEDS). Our graduation rate variable was taken to be the ratio of the number of completers to the size of the adjusted cohort, multiplied by 100. We are able to calculate this graduation rate for specific races.<sup>4</sup>

*d. Other Control Variables*

Most of our control variables come from the Institutional Characteristics (IC) survey. We include categorical variables for geographic features such as the state and region. To control for institutional type, we utilized a school's Carnegie classification (16 different categories that we condensed into three: doctoral, masters, bachelors) and created an indicator variable for whether a school was private or public. For the size of the institution, we added together undergraduate enrollment (fteug) and graduate enrollment (ftegd), both of which were from the IPEDS 12-month Enrollment Survey (E12), to create a full-time equivalent variable, or FTE. We then used this created FTE variable to sort the institutions into three equal sized terciles: small, medium and large.

Summary statistics for all our data are listed in Appendix Table A1. Column 1 lists averages for all our institutions throughout the years, whereas columns 2 and 3 split the data into HBCU and non-HBCU schools respectively. Note that our HBCU sample has an average graduation rate that is 10 points lower (42.6 v. 32.6), has double the amount of Pell grants per FTE as non-

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<sup>4</sup> In 2008, IPEDS created a new racial category of two or more ethnicities. We did not use this variable, but focused on those students considering themselves African-American. This coincides with the category ggrace18 in IPEDS, which became the variable grbkaat after 2008.

HBCUs, and has lower SAT scores at both the 25<sup>th</sup> and 75<sup>th</sup> percentiles. HBCUs also have a lower spending per FTE for all categories with the exception of administrative spending.

## METHODOLOGY

To see the effect being an HBCU has on undergraduate graduation rates, we build from Ryan (2004) and estimate a regression of the form:

$$(1) \quad \text{GradRate}_{i,t} = \alpha + \beta \text{HBCU}_i + \Gamma X_{i,t} + \delta_t + E_{i,t}$$

where HBCU is an indicator variable taking on the value of 1 if the institution is recognized as a HBCU, and 0 otherwise. A host of control variables are represented by  $X_{it}$ . We include *geographic variables* such as indicators for the state, as well as whether the institution is in an urban, suburban, town, or rural setting. We include *dummy variables for whether the school was large or medium sized* to control for potential economies of scale. We also capture *characteristics of the admitted class* by utilizing measures of Pell Grants as a proxy for the socioeconomic status of the class, with the argument that students with lesser means may be more likely to experience economic distress during their time at college which could make graduating less likely. We also include SAT scores to control for student preparedness for college. We include *institutional financial variables* to control for how a school chooses to spend its money on instruction, academic support and student services, with the idea that all three categories help students succeed academically, albeit through different channels. We also control for the size of the endowment, as this indicates a level of financial stability. Finally, within *institutional characteristics*, we distinguish between private and public schools, with the hypothesis that public schools are prone to more financial volatility due to receiving part of their revenue from their state legislature. We include *dummy variables for various Carnegie classifications* to indicate the main focus of the institution, thinking that the more the focus is on undergraduate education, the better the graduation rate may be. Similarly, we include indicators if the institution is religiously affiliated.

One econometric concern involves asking if comparing Harvard with Alabama A&M is fair, given the differences in resources between the two institutions. So while we will estimate



equation 1 for all institutions in our sample, we also want to make sure we're doing an 'apples to apples' comparison to see if the choice of sample matters. To that end, we implement two separate matching methods, with the idea being that we want the sample of schools we base our estimation on to be relatively similar.

Traditional matching models use a variety of controls and look for schools that exactly match on those characteristics. Given the nature of our data with IPEDS, the likelihood of exact matching yielding a large sample is very small. In some categories, HBCUs are outliers, and relying on exact matching results in many unmatched HBCUs, which causes them to be dropped from the analysis. As a result, we utilize the coarsened exact matching (CEM) algorithm of Iacus, King and Porro (2008) as implemented in Stata by Blackwell, Iacus, King and Porro (2010).

The intuition behind CEM matching is that for every variable we want to match on, we divide the data into a certain number of bins, and consider schools a match if their data falls in the same bin. So if a variable X ranges from 1-10, we could create 3 bins (1-3, 4-6, 7-10). A school with a value of 2 would be considered a match for a school with a value of 3, as they fall in the same bin. This so-called coarsening of the data is less restrictive and allows for significantly more HBCUs to be matched. Because the choice of both variables to match on and the size of the bin is left to the researcher, we try a variety of different combinations in order to check the sensitivity of our results.

As an alternate matching approach, we also entered each HBCU into Carnegie Lookup<sup>5</sup>, which is an online matching program. We matched on the basis of 6 categories: undergraduate instructional program, enrollment profile, size and setting, basic, level, and control. The website would then list the schools considered a match for the entered school based on these variables. We also tried to replicate the Carnegie Lookup ourselves by using variables in IPEDS that we felt approximated these categories. The Carnegie Lookup creates a nice contrast to our other matching variables; being created by outside forces makes this a neutral measure involving no category creation on the part of the researcher.

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<sup>5</sup> Available at <http://carnegieclassifications.iu.edu/lookup/lookup.php>

## RESULTS

Table 1 shows results from using the entire sample of institutions as described above. Column 1 simply runs graduation rate with the HBCU dummy variable. Column 2 adds year dummies, whereas column 3 also adds state dummies. Note that the HBCU dummy is negative and significant in all three specifications, with an estimated effect of HBCUs having a graduation rate approximately 10 percentage points lower than other schools. This matches the gap in graduation rates we saw earlier in Figure 1 and in our summary statistics.

Column 4 adds institutional characteristics into the regression. Note that the HBCU dummy switches sign, indicating being an HBCU raises graduation rates by 11 percentage points. Column 5 adds expenditure data into the regression, as well as a dummy for whether SAT scores are never reported. Column 6 adds SAT scores into the mix if they are reported. As we add more controls, the HBCU remains positive and significant, with the most restrictive model yielding an estimated effect of an over 15 percentage point increase in graduation rates for being an HBCU.

Note that the control variables we include are also of the expected sign. SAT scores have a positive effect on graduation rates, but not reporting SAT scores, a signal of open enrollment, is associated with a 3 percentage point decrease in graduation rates. Spending on academic support, student services and instruction in general also increase graduation rates. Private schools have a slightly higher graduation rate than public schools, as do schools with a larger enrollment. The more Pell grants per FTE a school offers, the lower its graduation rate, which is consistent with the financial stress argument and previous work on SES status and graduation.

Out of concern that there may be a lagged effect of either admission standards or spending on graduation, we tried lagging our control variables by 1, 2, 3, and 4 years. The argument here is that a student potentially needs to be exposed to institutional spending for a number of years before it can realistically be expected to impact that student's graduation. As it turns out, the estimated coefficient on our HBCU remains significant and positive and of the same magnitude as in Table 1.<sup>6</sup>

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<sup>6</sup> We report these results in Appendix Table A2. Keep in mind that institutional spending tends to be rather sticky between years, which limits the amount of variation one sees across years at the institution level. We believe this fact is responsible in part for the lack of difference among the lags.

Table 2 reports results of our full model without SAT scores (i.e. column 5 from Table 1) when utilizing our various matched control groups. Column 1 indicates the match generated from the Carnegie Lookup. Column 2 uses a CEM match based on our interpretation of the Carnegie categories, dividing each category into 3 bins. Column 3 uses a CEM match based on Pell Grants per FTE with 3 bins.<sup>7</sup> Column 4 uses results from a CEM match based on the average 75<sup>th</sup> percentile SAT math score of the incoming class with 3 bins, and Column 5 uses both Pell Grants and the SAT math score with 3 bins. For robustness, we also estimated all 5 models with 5 bins instead of 3, but since they yielded similar results, we chose not to report them for the sake of brevity.<sup>8</sup>

Note that in all 5 matching procedures, our HBCU dummy remained positive and significant, ranging in value from just under 5 for the Carnegie Lookup match to a high of 10 for the SAT math match. When we use the matches and just regress the HBCU dummy alone (like in the first column of Table 1), we still get the negative point estimate on the dummy. What this suggests is that once proper controls are in place, the effect of HBCU on graduation rates is consistently positive. Note that our other control variables retain similar sign and significance from Table 1.

One potential concern with our matching process as shown in Table 2 is the way the HBCUs are distributed amongst the bins, as over 90% of all HBCU observations fall in the lowest bin when we use SAT scores to make the bins.<sup>9</sup> This implies that while we only have one or two HBCUs in the highest bin for any variables we match on, we bring in a large number of

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<sup>7</sup> In creating the Pell and SAT bins, for each institution we took the average of each institution over the entire time panel in order to assign an institution to a bin. When an institution failed to report an SAT score in a given year, we utilized two imputation techniques standard in the economics literature on missing data mechanisms (see Ford et al. (2008) for a more detailed discussion on our approach. Cox et al. (2014) argue for a multiple imputation approach for missing data in higher education, but given our focus on matching data, such a technique is not very effective for our purpose.)

Specifically, for missing SAT data between years of non-missing data, we simply interpolated the value. In observations for which there was no prior SAT score value recorded, we carried the earliest recorded value backward. When no SAT value was recorded after a given year, the most recent non-missing value was carried forward.

As it turns out, worrying about missing values for the purpose of calculating our bins had little impact on the bins schools ultimately fell into or our final results.

<sup>8</sup> The most obvious dimension one would think about matching would be racial/ethnic makeup of the student body. However, since that by definition creates a HBCU, we would end up with no HBCUs in our matched sample.

Hence, we are matching on variables that describe a HBCU that do not depend on racial characteristics explicitly.

<sup>9</sup> As it turns out, all our HBCUs fall into the same bin when we use the Pell measure, so the outlier problem only manifests itself when utilizing the SAT measures.

additional control institution observations into our analysis as a result.<sup>10</sup> A quick look at Columns 1-5 in Appendix Table A3 shows how this bias plays out; our mean graduation rates are too high relative to those of HBCUs (as listed in Appendix Table A1), and the outlier HBCUs are to blame. When we eliminate the outlier HBCUs and repeat our match, note that the balance on our key variables falls more in line, meaning that the quality of our control group is much improved.

Table 3 repeats Table 2 with this improved match. Note that our HBCU dummy still remains positive and significant throughout the various model specifications, but that the estimated coefficient is in a much tighter range of just over 6.

We add the SAT scores directly in Table 4, and the estimated coefficient on the HBCU dummy jumps by 5, now ranging from a low of just over 10 for the Carnegie Lookup to a high of just over 15 on the SAT math match. Columns 6 and 7 match without our outliers, and our estimated coefficient on the HBCU dummy tightens up once again, ranging between 8.2 and 9.3, which still represents an approximate 3 point increase from Table 3.

## **SEARCHING FOR MECHANISMS**

The results from Tables 1-4 suggest that once we have sufficient controls, HBCUs have a higher graduation rate than other institutions of similar stature. The gain from CEM is of limited value compared to the standard regression technique of matching on observable control variables. The next step we take is to explore possible mechanisms for why HBCU graduation rates are higher. We explore three potential avenues for this result: gender balance, major choice, and money.

### *a. Gender*

In terms of gender, we split out the overall graduation rate into male and female. The argument here is that if one gender performs stronger than another, and HBCUs are purposely targeting one gender over another when compared to other colleges, then that could explain our

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<sup>10</sup> While the actual outliers vary depending on the variables used to create the bins, they only include a combination of Howard, Morehouse, Spelman, Saint Augustine's and Hampton.

finding. Table 5 runs our full model for male and female graduation rates, both not including and including the SAT measures. Note that our HBCU coefficient remains positive and significant, but when we do not include SAT scores, the impact of an HBCU on women is 3 points higher. Once we include SAT measures, we once again get coefficient estimates of about 15 for both genders. Moreover, there is no statistical difference between the estimated HBCU effect between the two genders. Hence, gender cannot explain our result, as HBCUs improve the African-American graduation rate of both genders equally.

*b. Major Choice*

Table 6 explores the hypothesis that perhaps HBCUs have a higher graduation rate because they encourage students to choose certain majors. We therefore look at the percentage of total African-American graduates in one of 8 major categories (based on 2-digit CIP codes listed in IPEDS as described by Hawley and Rork (forthcoming) as our dependent variable, utilizing (but not reporting) all the controls including SAT scores from our graduation rate model.<sup>11</sup> The interpretation of the HBCU dummy here is the change in the proportion of students choosing a particular major. Regardless of whether we use all institutions or our various matching methods, our results indicate that HBCUs are more likely to graduate a higher share of their students in STEM majors and to a lesser extent majors in the humanities and social sciences, although the latter is not statistically significant. Instead, HBCUs appear to graduate a smaller share of students in business, art, general education, and professional/vocational majors. This trend, especially the large magnitude on the HBCU dummy for STEM majors in particular, argues against so-called major steering and is consistent with work by Owens et al. (2012), who showed that HBCU undergraduates accounted for 39% of all STEM degrees given to African-American students between 2001-2009. This is particularly striking given that only 17% of African-American students choose to enroll at a HBCU (Kim 2006).

*c. Money*

Having ruled out gender balance and major choice, we turn to money. Given the news in the popular press about financial difficulties at HBCUs, our expectation is that HBCUs should be significantly poorer than their non-HBCU peers. As shown previously in Table A1, HBCUs

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<sup>11</sup> Not including SAT scores yields similar patterns. For brevity we do not report them here, but the results are available upon request.

spend less on student services, instructional support, and academic support, whereas they spend more per FTE on administrative services. The first listing of Table 7 shows that these differences are all statistically significant as well.

We then ask if this pattern persists if we just look at private institutions or public institutions. For private institutions, we see exactly the same pattern as before. For public institutions, HBCUs spend slightly more on both student services and administration, but there is no statistical difference in spending on academic support.

We note that the majority of HBCUs are located in the Southeastern United States. To make sure we're making a fair comparison, we limit our sample to those institutions located in this part of the country. (Schools in the Northeast are older, on average, and have had a longer time to build an alumni base for donations, for example.) When we do so, HBCUs once again spend less than their peers, with the one exception once again being administration spending.

Finally, we utilize the work of Sav (1997), who shows that certain states have done a better job of funding their public HBCUs than others. To see if this potentially plays a role in the patterns we witnessed, we split our sample into those states Sav suggests fund HBCUs better than non-HBCUs and those that fund worse. In doing so, the pattern remains.

Hence, when looking at unconditional means, the pattern is consistent. HBCUs spend less on instruction and more on administrative costs. They spend less on academic support, although this finding is not always statistically robust. Also, private HBCUs tend to spend less on student services, whereas public HBCUs tend to spend more. Given that HBCUs lag behind in most spending categories, we conclude this is not a contributor to HBCU success.

## **CONCLUSION**

A first glance at HBCU graduation rates suggests that their students do worse than students at non-HBCUs in the US. And while it is true that HBCU graduation rates are lower, this paper argues that national comparisons such as Figure 1 give a false picture of the reality on the ground. Once we control for financial and institutional variables that differentiate colleges

and universities, we discover that HBCUs not only do better than their peers in graduating students, but their students are graduating with a higher proportion of STEM degrees.

While our results show that HBCUs are doing more with less, they fail to point to a mechanism as to why. Is there something hidden within administrative spending that contributes to HBCU success? Does success come from intangibles (campus culture, peer effects) that are impossible to measure, at least via the IPEDS? Further research to pinpoint the source of success would be valuable. Regardless, our results lead us to argue that ensuring the financial health of HBCUs in the future will help narrow the African-American graduation gap going forward.

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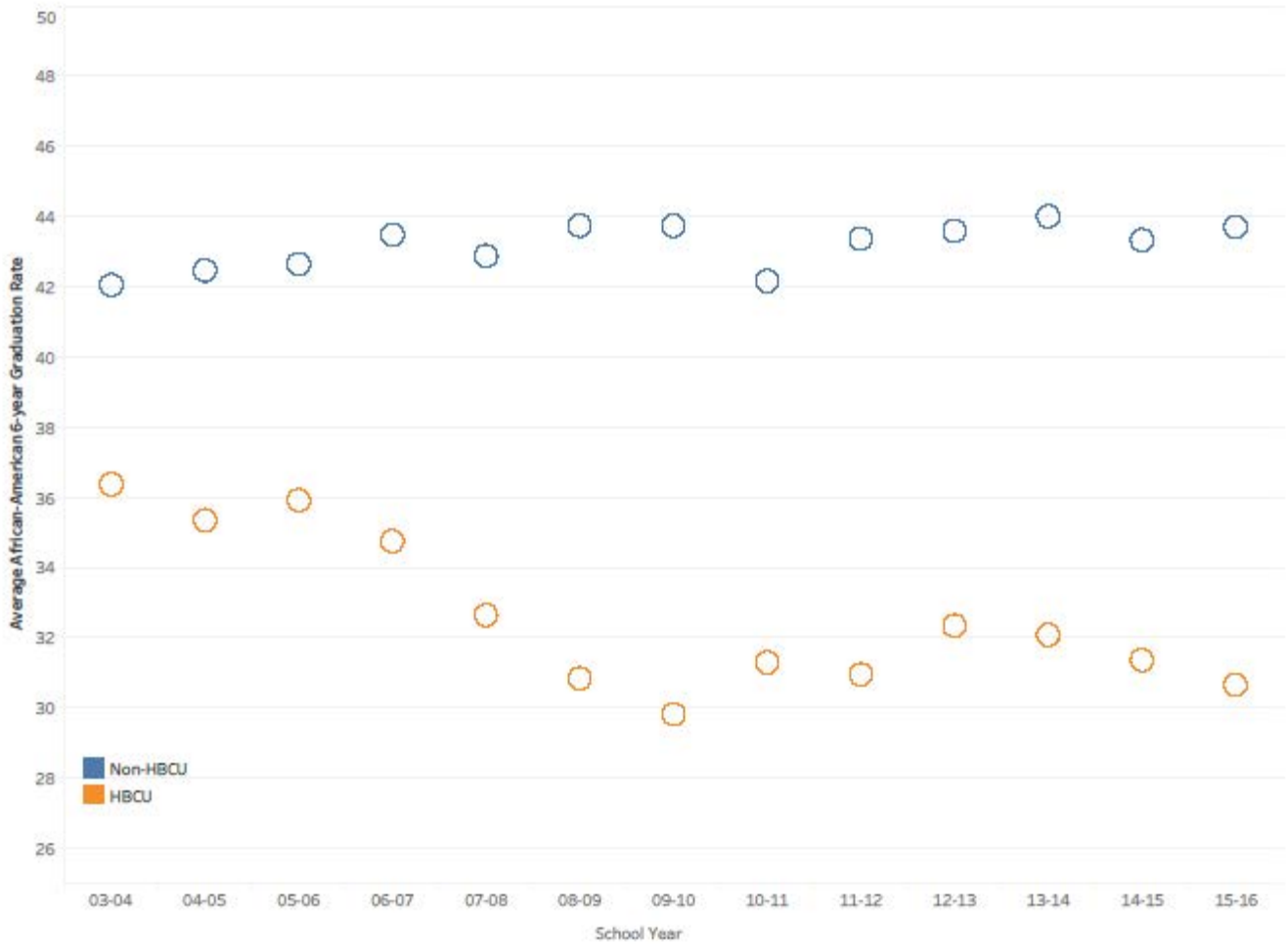
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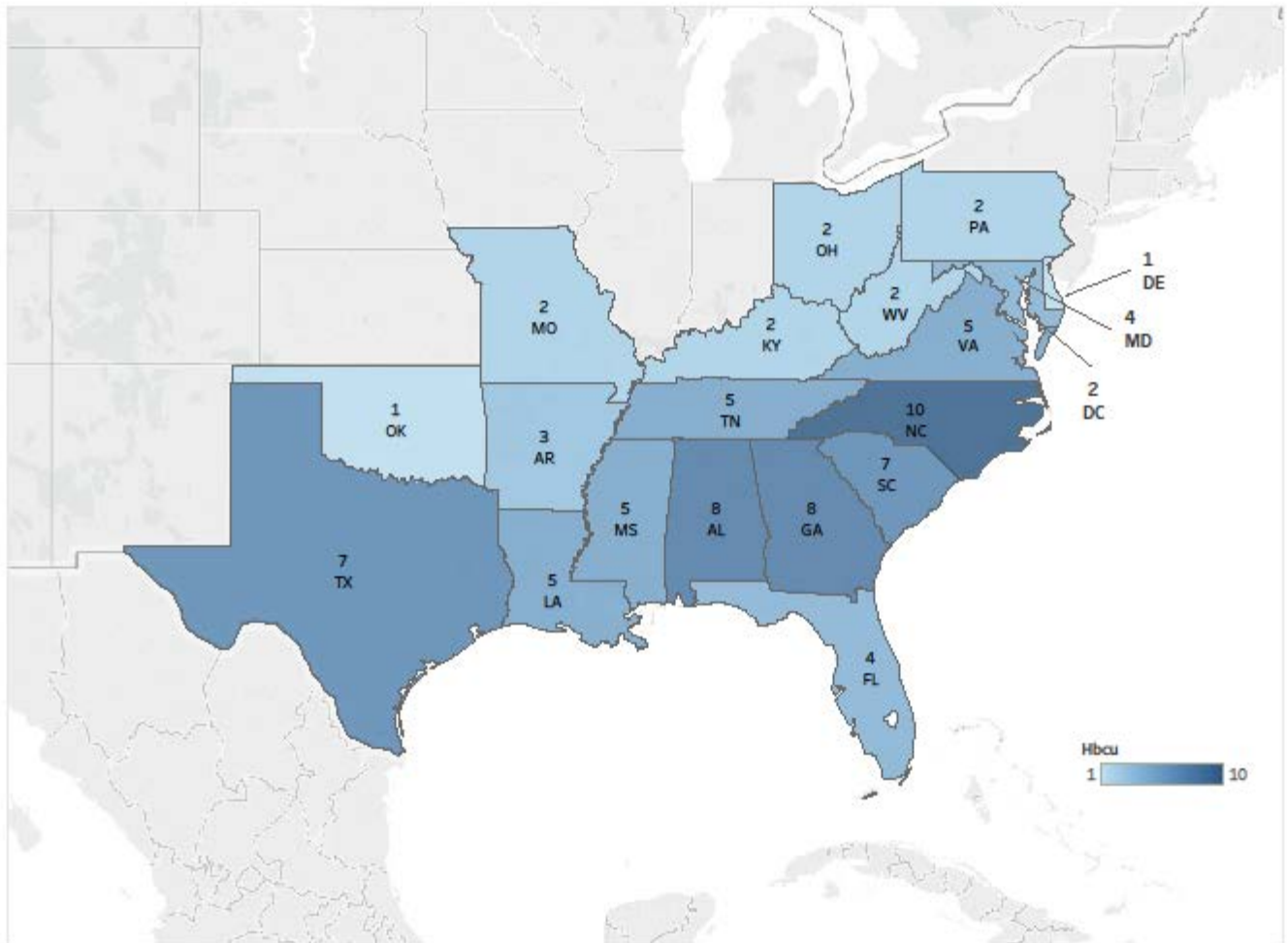
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Figure 1: Six Year African-American Graduation Rates, By Institution Type and Year



Source: Integrated Postsecondary Education Data System data and authors' calculations. Average African-American 6-year graduation rate for each school year by HBCU status. Color shows HBCU status.

Figure 2: Number of HBCUs in IPEDS, by state in 2018



Source: Integrated Postsecondary Education Data System data and authors' calculation. The HBCUs included in this map do not include associate colleges or those outside the continental US.

**Table 1: HBCU effect on graduation rates - no control groups**

	(1)	(2)	(3)	(4)	(5)	(6)
HBCU dummy (1=Yes)	-10.5538*** (0.7866)	-10.5511*** (0.7867)	-9.8349*** (0.7937)	11.4255*** (0.8187)	10.4196*** (0.8172)	15.1112*** (0.8819)
<i><u>Institutional Characteristics</u></i>						
Medium size (1=Yes)				3.3250*** (0.4644)	3.8348*** (0.4707)	1.4560*** (0.4992)
Large size (1=Yes)				5.2294*** (0.6379)	5.8343*** (0.6476)	2.5110*** (0.6836)
Pell grants per FTE <sup>1</sup>				-0.0118*** (0.0003)	-0.0109*** (0.0003)	-0.0034*** (0.0004)
Endowment per FTE <sup>2</sup>				33.9760*** (1.0951)	16.1284*** (1.4281)	1.3355 (1.4794)
Private (1=Yes)				6.0716*** (0.5130)	3.8627*** (0.5264)	1.7545*** (0.5383)
Religiously affiliated (1=Yes)				-2.3148*** (0.4408)	-1.1093** (0.4412)	0.6094 (0.4384)
Urban campus (1=Yes)				2.4567*** (0.6302)	2.1003*** (0.6236)	0.8670 (0.6438)
Suburban campus (1=Yes)				2.3353*** (0.6770)	2.1834*** (0.6689)	1.4278** (0.6812)
Town campus (1=Yes)				3.1184*** (0.6541)	2.8063*** (0.6465)	1.5840** (0.6682)
Carnegie doctoral classification				4.7067*** (0.6009)	2.7883*** (0.6228)	1.5163** (0.6235)
Carnegie masters classification				-5.4031*** (0.4170)	-4.9613*** (0.4151)	-1.3051*** (0.4259)
No SAT reported (1=Yes)				-4.4003*** (0.5936)	-4.2544*** (0.5881)	
<i><u>Expenditures</u></i> <sup>3</sup>						
Student services					0.7263*** (0.0912)	0.3998*** (0.0926)
Instruction					0.3465*** (0.0287)	0.0561** (0.0283)
Academic support					0.3175*** (0.0573)	0.0571 (0.0625)
Institutional support					-0.0558 (0.0657)	-0.0572 (0.0742)
<i><u>Student Preparedness</u></i>						
SAT verbal 25th percentile						0.1190*** (0.0085)
SAT verbal 75th percentile						0.0151** (0.0075)
SAT math 25th percentile						0.0220*** (0.0083)
SAT math 75th percentile						0.0306*** (0.0078)
Constant	43.1838*** (0.1839)	42.3316*** (0.6530)	42.2559*** (0.6177)	41.8977*** (0.9936)	37.9691*** (1.0120)	-54.7448*** (2.4547)
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	18,925	18,925 <sub>20</sub>	18,925	17,691	17,691	13,809
R-squared	0.0094	0.0099	0.1169	0.3497	0.3656	0.4733

Notes: Standard errors in parentheses; \*\*\*, \*\* and \* imply statistical significance at the 10, 5 and 1 percent level, respectively. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent. <sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent. <sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars.

Table 2: HBCU effects on graduation rates - CEM control groups without student preparedness measures

	(1)	(2)	(3)	(4)	(5)
	<u>Carnegie Online</u>	<u>Carnegie Duplication</u>	<u>Pell CEM</u>	<u>SAT Math CEM</u>	<u>Pell/SAT CEM</u>
HBCU dummy (1=Yes)	5.3867*** (1.3324)	4.9645*** (1.1423)	7.0572*** (0.9369)	10.3903*** (0.8681)	7.1502*** (0.8850)
<i><u>Institutional Characteristics</u></i>					
Medium size (1=Yes)	8.0914*** (0.9650)	5.0066*** (1.0547)	-0.0750 (0.7506)	4.8265*** (0.4897)	1.1253** (0.5727)
Large size (1=Yes)	14.1219*** (1.8157)	7.4440*** (1.6964)	0.5579 (1.1009)	7.2966*** (0.6788)	2.8792*** (0.8496)
Pell grants per FTE <sup>1</sup>	-0.0071*** (0.0006)	-0.0083*** (0.0006)	-0.0046*** (0.0005)	-0.0116*** (0.0003)	-0.0065*** (0.0004)
Endowment per FTE <sup>2</sup>	6.9251* (3.7176)	0.5900 (2.6639)	88.5152*** (7.5685)	9.9963*** (1.5390)	41.8083*** (4.9642)
Private (1=Yes)	16.0338*** (1.7473)	6.3340*** (1.3826)	7.2494*** (1.0040)	2.7260*** (0.5562)	3.9576*** (0.7842)
Religiously affiliated (1=Yes)	-4.1964*** (1.0351)	-4.6873*** (1.1650)	-4.2986*** (0.8669)	-0.6881 (0.4464)	-0.2251 (0.6061)
Urban campus (1=Yes)	1.1703 (1.2413)	7.1705*** (1.1660)	0.7702 (0.8623)	2.1982*** (0.6408)	0.9460 (0.7202)
Suburban campus (1=Yes)	2.1820 (1.3595)	6.1798*** (1.2820)	0.2074 (1.0667)	2.3394*** (0.6822)	1.0252 (0.7925)
Town campus (1=Yes)	2.2561** (1.1497)	5.0185*** (1.1658)	1.1357 (0.8756)	2.9646*** (0.6625)	3.2238*** (0.7391)
Carnegie doctoral classificator	-3.9531 (2.5045)	-0.5057 (1.7277)	4.6523*** (1.3744)	2.0191*** (0.6341)	3.4680*** (0.8942)
Carnegie masters classificator	-3.1093** (1.2800)	0.7264 (1.3363)	-0.1845 (0.7400)	-5.0071*** (0.4255)	-0.2855 (0.5050)
No SAT reported (1=Yes)	1.3904 (1.3958)	-34.4395** (14.3463)	-2.6892*** (0.8031)		
<i><u>Expenditures</u></i> <sup>3</sup>					
Student services	0.3116 (0.2215)	1.4133*** (0.2532)	-0.2454 (0.2121)	0.9856*** (0.0949)	-0.3872** (0.1685)
Instruction	1.1892*** (0.1278)	0.3884*** (0.0557)	0.5038*** (0.1148)	0.3991*** (0.0293)	0.6979*** (0.0899)
Academic support	0.5112* (0.2971)	0.9157*** (0.1437)	0.0544 (0.2638)	0.3053*** (0.0572)	0.4165** (0.1952)
Institutional support	-0.1925 (0.1609)	0.2400 (0.1570)	-0.2356* (0.1278)	0.1219 (0.0751)	0.0994 (0.1090)
Constant	23.2612*** (2.4664)	29.5653*** (2.2413)	29.6110*** (1.6001)	36.9664*** (1.0567)	29.4296*** (1.2840)
Observations	3,517	2,471	5,542	16,253	9,709
R-squared	0.5017	0.5203	0.1734	0.3788	0.1655

Notes: All specifications include year and state fixed effects. Standard errors in parentheses; \*\*\*, \*\* and \* imply statistical significance at the 10, 5 and 1 percent level, respectively. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent. <sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent. <sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars.

Table 3: HBCU effect on African-American graduation rates, using CEM control groups without select HBCUs

	(1)	(2)
	SAT Math CEM	Pell/SAT CEM
HBCU dummy (1=Yes)	6.1174*** (1.0050)	6.3001*** (1.1134)
<i>Institutional Characteristics</i>		
Medium size (1=Yes)	-1.1281 (0.7275)	0.5183 (0.9734)
Large size (1=Yes)	0.1790 (1.1248)	1.9940 (1.4435)
Pell grants per FTE <sup>1</sup>	-0.0040*** (0.0005)	-0.0037*** (0.0006)
Endowment per FTE <sup>2</sup>	1.4413 (10.7518)	98.2335*** (31.3843)
Private (1=Yes)	3.7446*** (1.0294)	6.0572*** (1.3706)
Religiously affiliated (1=Yes)	0.2139 (0.7910)	-1.7591 (1.1392)
Urban campus (1=Yes)	0.2174 (0.8623)	-0.7850 (1.0057)
Suburban campus (1=Yes)	0.9190 (0.9809)	0.8123 (1.2733)
Town campus (1=Yes)	2.6937*** (0.8782)	2.0604** (1.0161)
Carnegie doctoral classification	1.0476 (1.5727)	0.0338 (1.9505)
Carnegie masters classification	0.1266 (0.6534)	-0.7926 (0.8933)
<i>Expenditures</i> <sup>3</sup>		
Student services	-0.7172*** (0.2080)	-0.6611*** (0.2559)
Instruction	0.3905*** (0.1295)	0.8543*** (0.1758)
Academic support	0.3435 (0.2581)	0.4921 (0.3600)
Institutional support	-0.1699 (0.1377)	-0.4726*** (0.1646)
Constant	30.7207*** (1.6182)	25.8327*** (1.9987)
HBCU outliers removed <sup>4</sup>	Yes	Yes
Observations	5,123	3,203
R-squared	0.1430	0.1564

Notes: All specifications include year and state fixed effects. Standard errors in parentheses; \*\*\*, \*\* and \* imply statistical significance at the 10, 5 and 1 percent level, respectively. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent. <sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent.

<sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars. <sup>4</sup>During the coarsened exact matching for the SAT, and Pell/SAT control groups, a select few HBCUs, no more than 6 institutions, were distorting the balancing of the match. We re-estimate these models with those institutions removed.

Table 4: HBCU effects on African-American Graduation Rates - CEM control groups with student preparedness measures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Carnegie Online	Carnegie Duplication	Pell CEM	SAT Math CEM	Pell/SAT CEM	SAT Math CEM	Pell/SAT CEM
HBCU dummy (1=Yes)	10.1155*** (1.6209)	11.8382*** (1.1808)	11.7165*** (1.1344)	15.1112*** (0.8819)	12.1116*** (0.9869)	9.3012*** (1.1788)	8.2403*** (1.3217)
<i><u>Institutional Characteristics</u></i>							
Medium size (1=Yes)	7.3359*** (1.1354)	1.6417 (1.0121)	-0.2419 (0.8797)	1.4560*** (0.4992)	0.2207 (0.6141)	-1.0452 (0.8089)	0.4484 (1.1123)
Large size (1=Yes)	10.7488*** (2.2034)	1.5401 (1.6585)	0.4816 (1.3346)	2.5110*** (0.6836)	0.6407 (0.9075)	-0.2293 (1.2349)	1.6815 (1.6167)
Pell grants per FTE <sup>1</sup>	-0.0040*** (0.0008)	-0.0027*** (0.0007)	-0.0025*** (0.0007)	-0.0034*** (0.0004)	-0.0028*** (0.0005)	-0.0024*** (0.0005)	-0.0017** (0.0008)
Endowment per FTE <sup>2</sup>	2.7767 (4.1078)	-1.7975 (2.4686)	59.9837*** (7.6747)	1.3355 (1.4794)	21.3727*** (4.9364)	-5.4603 (10.6687)	54.7077* (33.0404)
Private (1=Yes)	9.2567*** (2.0619)	4.9934*** (1.3124)	4.6712*** (1.2172)	1.7545*** (0.5383)	3.0964*** (0.8171)	2.6951** (1.1049)	5.4781*** (1.4898)
Religiously affiliated (1=Yes)	-1.8660* (1.1177)	-2.5725** (1.0994)	-2.0531** (0.9843)	0.6094 (0.4384)	0.1047 (0.6260)	0.8322 (0.8523)	-1.6660 (1.2440)
Urban campus (1=Yes)	2.1746 (1.4317)	6.3594*** (1.1262)	1.0450 (0.9698)	0.8670 (0.6438)	0.6846 (0.7727)	0.8571 (0.9551)	-0.0785 (1.1201)
Suburban campus (1=Yes)	2.2249 (1.5283)	4.9470*** (1.2316)	0.9459 (1.1907)	1.4278** (0.6812)	1.2113 (0.8438)	1.8006* (1.0744)	0.7590 (1.4073)
Town campus (1=Yes)	2.2147* (1.3332)	5.2091*** (1.1334)	1.2844 (0.9822)	1.5840** (0.6682)	2.8763*** (0.7976)	2.4562** (0.9759)	1.6701 (1.1284)
Carnegie doctoral classification	-5.4202* (3.0248)	1.2064 (1.6493)	3.8645** (1.5234)	1.5163** (0.6235)	4.4117*** (0.9373)	1.8009 (1.6861)	0.4272 (2.1759)
Carnegie masters classification	-1.5865 (1.4225)	3.3753*** (1.2778)	-1.0812 (0.8210)	-1.3051*** (0.4259)	-0.1218 (0.5239)	0.2302 (0.6891)	-1.0948 (0.9581)

Table 4 (continued): HBCU effects on African-American Graduation Rates - CEM control groups with student preparedness measures

	(1) Carnegie Online	(2) Carnegie Duplication	(3) Pell CEM	(4) SAT Math CEM	(5) Pell/SAT CEM	(6) SAT Math CEM	(7) Pell/SAT CEM
<i>Expenditures</i> <sup>3</sup>							
Student services	0.5457** (0.2535)	0.8090*** (0.2516)	-0.2470 (0.2424)	0.3998*** (0.0926)	-0.4079** (0.1792)	-0.5497** (0.2273)	-0.3397 (0.2812)
Instruction	0.6651*** (0.1544)	0.0613 (0.0540)	0.5935*** (0.1372)	0.0561** (0.0283)	0.4316*** (0.0958)	0.3821*** (0.1427)	0.7707*** (0.1922)
Academic support	0.3789 (0.3392)	0.2967** (0.1343)	0.2121 (0.2941)	0.0571 (0.0625)	0.2945 (0.2031)	0.0295 (0.2799)	0.4325 (0.3916)
Institutional support	-0.2291 (0.1986)	0.0875 (0.1646)	-0.4742*** (0.1477)	-0.0572 (0.0742)	-0.1245 (0.1204)	-0.2606 (0.1640)	-0.6815*** (0.2033)
<i>Student Preparedness</i>							
SAT verbal 25th percentile	0.0889*** (0.0185)	0.1071*** (0.0171)	0.0733*** (0.0138)	0.1190*** (0.0085)	0.1053*** (0.0105)	0.0754*** (0.0144)	0.0663*** (0.0173)
SAT verbal 75th percentile	-0.0106 (0.0164)	0.0111 (0.0145)	0.0178 (0.0110)	0.0151** (0.0075)	0.0074 (0.0087)	0.0239** (0.0116)	0.0437*** (0.0141)
SAT math 25th percentile	-0.0110 (0.0179)	0.0414** (0.0166)	-0.0182 (0.0134)	0.0220*** (0.0083)	-0.0059 (0.0104)	-0.0328** (0.0143)	-0.0405** (0.0169)
SAT math 75th percentile	0.0405** (0.0167)	0.0140 (0.0151)	0.0273** (0.0116)	0.0306*** (0.0078)	0.0308*** (0.0091)	0.0131 (0.0126)	-0.0066 (0.0151)
Constant	-26.8305*** (6.2562)	-52.4972*** (5.0780)	-18.9431*** (4.9153)	-54.7448*** (2.4547)	-34.7213*** (3.6096)	-7.6095 (5.4662)	-4.4868 (6.7379)
HBCU outliers removed <sup>4</sup>	No	No	No	No	No	Yes	Yes
Observations	2,613	2,192	3,763	13,809	7,976	4,192	2,507
R-squared	0.5312	0.6076	0.2350	0.4733	0.2113	0.1585	0.1868

Notes: All specifications include year and state fixed effects. Standard errors in parentheses; \*\*\*, \*\* and \* imply statistical significance at the 10, 5 and 1 percent level, respectively. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent. <sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent. <sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars. <sup>4</sup>During the coarsened exact matching for the SAT, and Pell/SAT control groups, a select few HBCUs, no more than 6 institutions, were distorting the balancing of the match. We re-estimate these models with those institutions removed.



Table 5: HBCU Impact on African-American graduation rates, by gender

	(1)	(2)	(3)	(4)
	MEN No SAT	WOMEN No SAT	MEN SAT	WOMEN SAT
HBCU dummy (1=Yes)	8.8988*** (0.9619)	11.1842*** (0.9847)	14.4199*** (1.0737)	14.9409*** (1.1125)
<i>Institutional Characteristics</i>				
Medium size (1=Yes)	4.1457*** (0.5790)	4.3605*** (0.5869)	1.1495* (0.6394)	2.2046*** (0.6476)
Large size (1=Yes)	6.5495*** (0.7813)	6.0143*** (0.7940)	2.4895*** (0.8578)	2.9520*** (0.8747)
Pell grants per FTE <sup>1</sup>	-0.0109*** (0.0004)	-0.0111*** (0.0004)	-0.0040*** (0.0005)	-0.0032*** (0.0005)
Endowment per FTE <sup>2</sup>	11.1234*** (1.7942)	14.6172*** (1.7676)	2.3544 (1.8064)	-0.0906 (1.9026)
Private (1=Yes)	2.6881*** (0.6292)	3.8601*** (0.6400)	1.3818** (0.6609)	2.2065*** (0.6831)
Religiously affiliated (1=Yes)	0.0362 (0.5319)	-1.4549*** (0.5370)	1.1637** (0.5483)	0.4471 (0.5559)
Urban campus (1=Yes)	2.3663*** (0.7453)	0.2225 (0.7727)	0.6358 (0.7984)	-1.5661* (0.8305)
Suburban campus (1=Yes)	1.7431** (0.7983)	1.1324 (0.8250)	0.6277 (0.8438)	-0.0614 (0.8754)
Town campus (1=Yes)	3.3224*** (0.7678)	3.0624*** (0.8046)	1.8399** (0.8231)	1.1948 (0.8658)
Carnegie doctoral classification	1.0765 (0.7272)	3.6954*** (0.7518)	-0.5352 (0.7562)	2.3271*** (0.7857)
Carnegie masters classification	-5.1827*** (0.4954)	-5.3201*** (0.5060)	-1.9218*** (0.5256)	-1.9540*** (0.5415)
No SAT reported (1=Yes)	-2.7490*** (0.7050)	-6.5531*** (0.7233)		
<i>Expenditures</i> <sup>3</sup>				
Student services	1.0097*** (0.1130)	0.8016*** (0.1132)	0.5414*** (0.1170)	0.4629*** (0.1197)
Instruction	0.4151*** (0.0342)	0.2924*** (0.0350)	0.0482 (0.0344)	0.0420 (0.0358)
Academic support	0.3235*** (0.0664)	0.3266*** (0.0685)	0.0403 (0.0754)	0.1090 (0.0781)
Institutional support	0.1335 (0.0823)	0.0481 (0.0832)	-0.0444 (0.0923)	-0.0842 (0.0971)
<i>Student Preparedness</i>				
SAT verbal 25th percentile			0.1063*** (0.0105)	0.0950*** (0.0110)
SAT verbal 75th percentile			0.0084 (0.0093)	0.0162* (0.0097)
SAT math 25th percentile			0.0300*** (0.0102)	0.0520*** (0.0106)
SAT math 75th percentile			0.0431*** (0.0097)	0.0172* (0.0101)
Constant	31.6932*** (1.2206)	42.8455*** (1.2532)	-59.4928*** (3.0154)	-45.3683*** (3.1264)
Observations	16,510	25 16,883	12,931	13,266
R-squared	0.3083	0.2943	0.3930	0.3596

Notes: All specifications include year and state fixed effects. Standard errors in parentheses; \*\*\*, \*\* and \* imply statistical significance at the 10, 5 and 1 percent level, respectively. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent. <sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent. <sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars.

Table 6: HBCU effect on student major choice, by major category

	<u>Major Category</u>								
	STEM	Social Science	Humanities	Education	Business	Professional or Vocational	General Education	Fine Arts	Other
<u>No Control group</u>									
HBCU dummy (1=YES)	0.1140*** (0.0072)	0.0138 (0.0087)	0.0133*** (0.0044)	-0.0059 (0.0046)	-0.0502*** (0.0097)	-0.0366*** (0.0082)	-0.0195*** (0.0066)	-0.0327*** (0.0066)	-0.0178** (0.0079)
<u>Carnegie Online</u>									
HBCU dummy (1=YES)	0.1209*** (0.0120)	0.0567*** (0.0165)	0.0136 (0.0088)	-0.0229** (0.0101)	-0.0628*** (0.0167)	-0.0095 (0.0135)	-0.0311*** (0.0111)	-0.0053 (0.0080)	-0.0319** (0.0128)
<u>Carnegie Duplication</u>									
HBCU dummy (1=YES)	0.1357*** (0.0095)	0.0302** (0.0120)	0.0198*** (0.0061)	-0.0355*** (0.0070)	-0.0428*** (0.0122)	-0.0461*** (0.0096)	-0.0430*** (0.0099)	-0.0009 (0.0053)	-0.0486*** (0.0106)
<u>Pell CEM</u>									
HBCU dummy (1=YES)	0.0912*** (0.0073)	-0.0026 (0.0114)	0.0127** (0.0055)	-0.0099 (0.0067)	-0.0325** (0.0138)	-0.0232** (0.0118)	-0.0325*** (0.0112)	-0.0440*** (0.0089)	-0.0249** (0.0111)
<u>SAT Math CEM</u>									
HBCU dummy (1=YES)	0.1140*** (0.0072)	0.0138 (0.0087)	0.0133*** (0.0044)	-0.0059 (0.0046)	-0.0502*** (0.0097)	-0.0366*** (0.0082)	-0.0195*** (0.0066)	-0.0327*** (0.0066)	-0.0178** (0.0079)
<u>Pell/SAT CEM</u>									
HBCU dummy (1=YES)	0.0858*** (0.0065)	-0.0084 (0.0095)	0.0045 (0.0045)	-0.0072 (0.0054)	-0.0270** (0.0112)	-0.0221** (0.0096)	-0.0291*** (0.0082)	-0.0379*** (0.0075)	-0.0077 (0.0093)
<u>SAT Math CEM<sup>1</sup></u>									
HBCU dummy (1=YES)	0.0887*** (0.0071)	-0.0245** (0.0112)	-0.0005 (0.0055)	-0.0046 (0.0066)	-0.0284** (0.0136)	-0.0143 (0.0123)	-0.0101 (0.0112)	0.0000 (0.0082)	-0.0160 (0.0118)
<u>Pell/SAT CEM<sup>1</sup></u>									
HBCU dummy (1=YES)	0.0822*** (0.0079)	-0.0205 (0.0132)	0.0011 (0.0062)	-0.0046 (0.0079)	-0.0391** (0.0158)	-0.0053 (0.0135)	-0.0217 (0.0141)	-0.0309*** (0.0094)	-0.0122 (0.0135)

Note: The dependent variable is the proportion of African-American students graduating within each major category, defined by 2-digit CIP code. Results are similar with shares of total student population graduating with each major category. All specifications include year and state fixed effects and the full set of control variables: institutional characteristics, expenditures, and student preparedness. Standard errors in parentheses; \*\*\*, \*\* and \* imply statistical significance at the 10, 5 and 1 percent level, respectively. <sup>1</sup>During the coarsened exact matching for the SAT, and Pell/SAT control groups, a select few HBCUs, no more than 6 institutions, were distorting the balancing of the match. We re-estimate these models with those institutions removed.

Table 7: Differences in Unconditional Means between HBCUs and non-HBCUs, by expenditure category

	<u>Full Sample</u>				<u>Southeast Institutions Only</u>			
	Non-HBCU	HBCU	Difference	t-value	Non-HBCU	HBCU	Difference	t-value
<u>Expenditures</u>								
Student services	3.200	2.373	0.827	10.460	2.877	2.367	0.510	6.593
Instruction	9.956	6.990	2.966	10.501	8.424	6.711	1.713	6.951
Academic support	2.611	2.099	0.512	4.608	2.249	1.946	0.303	1.810
Institutional support	4.397	5.294	-0.897	-6.962	3.851	5.123	-1.272	-11.546
	<u>Public Institutions Only</u>				<u>Private Institutions Only</u>			
	Non-HBCU	HBCU	Difference	t-value	Non-HBCU	HBCU	Difference	t-value
<u>Expenditures</u>								
Student services	1.685	1.855	-0.169	-2.593	4.021	2.866	1.155	10.141
Instruction	8.363	7.205	1.157	5.561	10.818	6.785	4.033	8.723
Academic support	2.169	2.121	0.048	0.597	2.851	2.078	0.773	4.224
Institutional support	2.409	3.688	-1.279	-13.382	5.474	6.824	-1.351	-6.877
	<u>Sav States where HBCU worse off</u>				<u>Sav States where HBCU better off</u>			
	Non-HBCU	HBCU	Difference	t-value	Non-HBCU	HBCU	Difference	t-value
<u>Expenditures</u>								
Student services	2.865	2.318	0.546	5.451	3.175	2.478	0.697	6.078
Instruction	8.998	6.466	2.532	7.584	9.412	7.092	2.320	6.894
Academic support	2.370	2.167	0.203	0.188	2.444	2.053	0.391	3.035
Institutional support	3.869	5.143	-1.273	-9.225	4.407	5.476	-1.069	-6.217

Note: Expenditures are measured in per full-time equivalent terms and in thousands of dollars.

Appendix Table A1: Summary statistics

Variable	(1) <i>Full Sample</i>		(2) <i>HBCUs</i>		(3) <i>Non-HBCUs</i>	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
African-American graduation rate	42.6	24.7	32.6	14.8	43.2	25.0
<i>Institutional Characteristics</i>						
Medium size (1=Yes)	0.380	0.485	0.415	0.493	0.378	0.485
Large size (1=Yes)	0.412	0.492	0.286	0.452	0.419	0.493
Pell grants <sup>1</sup>	1172.9	801.7	2720.0	1006.4	1080.8	685.4
Endowment <sup>2</sup>	0.047	0.149	0.012	0.019	0.049	0.153
Private (1=Yes)	0.634	0.482	0.512	0.500	0.641	0.480
Religiously affiliated (1=Yes)	0.384	0.486	0.428	0.495	0.382	0.486
Urban campus (1=Yes)	0.476	0.499	0.620	0.486	0.468	0.499
Suburban campus (1=Yes)	0.231	0.421	0.104	0.306	0.238	0.426
Town campus (1=Yes)	0.219	0.414	0.165	0.372	0.222	0.416
Carnegie doctoral classification	0.169	0.374	0.086	0.281	0.173	0.379
Carnegie masters classification	0.378	0.485	0.350	0.477	0.380	0.485
No SAT reported (1=Yes)	0.097	0.296	0.198	0.399	0.091	0.287
<i>Expenditures</i> <sup>3</sup>						
Student Services	3.1	2.5	2.4	1.4	3.2	2.5
Instruction	9.8	8.8	7.0	3.1	10.0	9.0
Academic Support	2.6	3.5	2.1	1.3	2.6	3.6
Institutional Support	4.4	4.0	5.3	3.4	4.4	4.1
<i>Student Preparedness</i>						
SAT verbal 25th percentile	477	68	386	44	482	66
SAT verbal 75th percentile	587	69	486	56	592	65
SAT math 25th percentile	483	73	383	44	488	70
SAT math 75th percentile	593	69	486	53	598	66
N*	18,925		1,034		17,891	

Notes: HBCUs are just over 5 percent of the full sample. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent.

<sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent. <sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars. \*Not all variables have data for all years or institutions; N stands for the maximum number of observations; not all variables are reported for all years.

Appendix Table A2: The impact of lagging variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1 Yr Lag	2 Yr Lag	3 Yr Lag	4 Yr Lag	1 Yr Lag	2 Yr Lag	3 Yr Lag	4 Yr Lag
SAT included?	No	No	No	No	Yes	Yes	Yes	Yes
HBCU dummy (1=Yes)	10.0462*** (0.8477)	9.6555*** (0.8808)	9.5858*** (0.9162)	9.7368*** (0.9544)	14.7684*** (0.9133)	14.3829*** (0.9485)	14.6031*** (0.9729)	14.0413*** (1.0085)
<i>Institutional Characteristics</i>								
Medium size (1=Yes)	3.7367*** (0.4850)	3.7148*** (0.5050)	3.5370*** (0.5266)	3.2736*** (0.5498)	1.6751*** (0.5101)	1.3301** (0.5313)	1.0571* (0.5497)	0.6577 (0.5707)
Large size (1=Yes)	5.7246*** (0.6657)	5.7730*** (0.6912)	5.3752*** (0.7180)	5.1916*** (0.7462)	2.8136*** (0.6977)	2.4166*** (0.7239)	1.9237*** (0.7447)	1.7459** (0.7695)
Pell grants per FTE <sup>1</sup>	-0.0110*** (0.0003)	-0.0107*** (0.0003)	-0.0107*** (0.0003)	-0.0107*** (0.0003)	-0.0031*** (0.0004)	-0.0031*** (0.0004)	-0.0026*** (0.0004)	-0.0024*** (0.0004)
Endowment per FTE <sup>2</sup>	18.7260*** (1.4923)	16.1462*** (1.5433)	19.1099*** (1.5773)	19.7567*** (1.5969)	2.4075 (1.5601)	1.1305 (1.5731)	3.5385** (1.5863)	2.9177* (1.6028)
Private (1=Yes)	3.8305*** (0.5421)	3.5011*** (0.5616)	3.2046*** (0.5848)	2.5921*** (0.6077)	1.9777*** (0.5529)	1.8822*** (0.5699)	1.8389*** (0.5848)	1.2332** (0.6041)
Religiously affiliated (1=Yes)	-0.9181** (0.4563)	-1.0185** (0.4727)	-0.7774 (0.4916)	-0.5945 (0.5121)	0.7727* (0.4483)	0.5215 (0.4623)	0.8561* (0.4762)	1.0599** (0.4918)
Urban campus (1=Yes)	2.1935*** (0.6398)	2.5046*** (0.6569)	2.3821*** (0.6834)	2.3863*** (0.7122)	0.5845 (0.6579)	1.1332* (0.6785)	0.8929 (0.6962)	1.2319* (0.7236)
Suburban campus (1=Yes)	2.3235*** (0.6875)	2.8775*** (0.7080)	2.5502*** (0.7364)	2.6170*** (0.7672)	1.2520* (0.6963)	2.0511*** (0.7186)	1.8311** (0.7372)	2.3068*** (0.7656)
Town campus (1=Yes)	2.9070*** (0.6637)	3.2889*** (0.6813)	2.9161*** (0.7079)	3.1237*** (0.7382)	1.5063** (0.6831)	1.9130*** (0.7040)	1.5240** (0.7225)	1.6898** (0.7516)
Carnegie doctoral classification	2.6795*** (0.6451)	2.6158*** (0.6682)	2.6831*** (0.6938)	2.6745*** (0.7214)	1.4180** (0.6419)	1.6284** (0.6640)	1.4807** (0.6833)	1.5548** (0.7062)
Carnegie masters classification	-5.0239*** (0.4294)	-4.9709*** (0.4453)	-4.9084*** (0.4628)	-5.1044*** (0.4813)	-1.2712*** (0.4375)	-1.3925*** (0.4523)	-1.2821*** (0.4651)	-1.4105*** (0.4810)
No SAT reported (1=Yes)	-4.3226*** (0.6104)	-4.5729*** (0.6323)	-4.6734*** (0.6588)	-4.5519*** (0.6843)				

Appendix Table A2 (continued): The impact of lagging variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1 Yr Lag	2 Yr Lag	3 Yr Lag	4 Yr Lag	1 Yr Lag	2 Yr Lag	3 Yr Lag	4 Yr Lag
SAT included?	No	No	No	No	Yes	Yes	Yes	Yes
<i>Lagged Expenditures</i> <sup>3</sup>								
Student services	0.6908*** (0.0950)	0.7960*** (0.1017)	0.7299*** (0.1065)	0.7726*** (0.1111)	0.3296*** (0.0950)	0.2977*** (0.0990)	0.2216** (0.1023)	0.1587 (0.1060)
Instruction	0.3831*** (0.0305)	0.4203*** (0.0325)	0.4296*** (0.0345)	0.4280*** (0.0366)	0.0671** (0.0298)	0.0531* (0.0316)	0.0311 (0.0332)	0.0371 (0.0351)
Academic support	0.3157*** (0.0609)	0.3246*** (0.0634)	0.2524*** (0.0677)	0.2673*** (0.0722)	0.0504 (0.0643)	0.0478 (0.0659)	0.0099 (0.0708)	0.0280 (0.0729)
Institutional support	-0.1657** (0.0658)	-0.1197* (0.0651)	-0.2007*** (0.0717)	-0.2567*** (0.0739)	-0.1305* (0.0774)	-0.0036 (0.0811)	-0.1605* (0.0843)	-0.0878 (0.0875)
<i>Lagged Student Preparedness</i>								
SAT verbal 25th percentile					0.0855*** (0.0088)	0.0938*** (0.0092)	0.1002*** (0.0094)	0.0986*** (0.0098)
SAT verbal 75th percentile					0.0352*** (0.0078)	0.0231*** (0.0080)	0.0228*** (0.0081)	0.0258*** (0.0086)
SAT math 25th percentile					0.0575*** (0.0085)	0.0604*** (0.0090)	0.0625*** (0.0092)	0.0776*** (0.0096)
SAT math 75th percentile					0.0122 (0.0081)	0.0118 (0.0084)	0.0147* (0.0087)	-0.0012 (0.0090)
Constant	45.0771*** (1.1842)	43.8804*** (1.2280)	45.1650*** (1.2642)	45.9861*** (1.2975)	-51.8637*** (2.6324)	-51.0391*** (2.7768)	-54.8288*** (2.8453)	-53.9420*** (2.9472)
Observations	16,332	14,992	13,631	12,281	12,810	11,790	10,718	9,628
R-squared	0.3717	0.3803	0.3875	0.3966	0.4814	0.4887	0.5046	0.5169

Notes: All specifications include year and state fixed effects. Standard errors in parentheses; \*\*\*, \*\* and \* imply statistical significance at the 10, 5 and 1 percent level, respectively. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent. <sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent. <sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars.

Appendix Table A3: Summary statistics for HBCUs, control groups, and full sample

Variable	(1)		(2)		(3)		(4)		(5)	
	<i>Carnegie Online</i>		<i>Carnegie Duplication</i>		<i>Pell (3Q)</i>		<i>SAT (3Q)</i>		<i>Pell/SAT</i>	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
African-American graduation rate	47.5	27.9	45.5	21.0	29.8	21.2	44.4	24.4	34.5	20.1
<i>Institutional Characteristics</i>										
Medium size (1=Yes)	0.503	0.500	0.236	0.425	0.308	0.462	0.386	0.487	0.373	0.484
Large size (1=Yes)	0.135	0.341	0.499	0.500	0.347	0.476	0.425	0.494	0.379	0.485
Pell grants <sup>1</sup>	1123.4	699.6	1168.5	686.5	1759.9	742.0	1040.6	637.4	1336.0	635.8
Endowment <sup>2</sup>	0.091	0.171	0.056	0.191	0.015	0.041	0.051	0.157	0.016	0.043
Private (1=Yes)	0.803	0.398	0.567	0.496	0.555	0.497	0.643	0.479	0.604	0.489
Religiously affiliated (1=Yes)	0.519	0.500	0.428	0.495	0.380	0.485	0.405	0.491	0.448	0.497
Urban campus (1=Yes)	0.217	0.413	0.402	0.490	0.459	0.498	0.460	0.498	0.422	0.494
Suburban campus (1=Yes)	0.214	0.410	0.189	0.391	0.130	0.337	0.242	0.428	0.211	0.408
Town campus (1=Yes)	0.440	0.497	0.318	0.466	0.284	0.451	0.225	0.417	0.273	0.445
Carnegie doctoral classification	0.010	0.099	0.173	0.379	0.050	0.217	0.185	0.389	0.086	0.280
Carnegie masters classification	0.211	0.408	0.414	0.493	0.376	0.485	0.383	0.486	0.463	0.499
No SAT reported (1=Yes)	0.047	0.212	0.007	0.084	0.160	0.366	-	-	0.000	0.000
<i>Expenditures</i> <sup>3</sup>										
Student Services	4.7	2.8	3.2	2.4	2.7	1.9	3.3	2.5	2.8	1.8
Instruction	10.1	6.3	10.0	10.0	6.8	3.8	10.1	8.8	7.3	3.4
Academic Support	2.5	2.2	2.4	3.2	1.7	1.3	2.6	3.5	1.7	1.2
Institutional Support	5.3	3.3	4.2	3.2	3.6	3.0	4.4	3.6	3.6	2.5
<i>Student Preparedness</i>										
SAT verbal 25th percentile	493	79	484	65	431	40	482	66	444	38
SAT verbal 75th percentile	606	75	591	64	545	46	592	65	555	43
SAT math 25th percentile	496	77	489	69	436	42	488	70	447	38
SAT math 75th percentile	605	70	595	65	551	44	598	66	559	40
N*	2,608		1,973		4,971		16,265		9,236	

Appendix Table A3 (continued): Summary statistics for HBCUs, control groups, and full sample

Variable	Outliers Removed					
	(6)		(7)		(8)	
	<i>HBCUs</i>		<i>SAT (3Q)<sup>4</sup></i>		<i>Pell/SAT<sup>4</sup></i>	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
African-American graduation rate	31.3	13.0	30.9	19.1	28.0	18.9
<i><u>Institutional Characteristics</u></i>						
Medium size (1=Yes)	0.411	0.492	0.382	0.486	0.323	0.468
Large size (1=Yes)	0.283	0.450	0.293	0.455	0.290	0.454
Pell grants <sup>1</sup>	2798.1	937.2	1448.7	695.4	1766.6	683.9
Endowment <sup>2</sup>	0.009	0.010	0.011	0.026	0.011	0.015
Private (1=Yes)	0.473	0.500	0.613	0.487	0.579	0.494
Religiously affiliated (1=Yes)	0.436	0.496	0.440	0.496	0.454	0.498
Urban campus (1=Yes)	0.602	0.490	0.364	0.481	0.379	0.485
Suburban campus (1=Yes)	0.113	0.316	0.221	0.415	0.138	0.345
Town campus (1=Yes)	0.167	0.373	0.287	0.453	0.324	0.468
Carnegie doctoral classification	0.080	0.272	0.022	0.147	0.020	0.140
Carnegie masters classification	0.364	0.481	0.453	0.498	0.371	0.483
No SAT reported (1=Yes)	0.214	0.410	0.000	0.000	0.000	0.000
<i><u>Expenditures<sup>3</sup></u></i>						
Student Services	2.3	1.4	2.8	1.8	2.8	1.9
Instruction	6.7	2.5	6.6	2.8	6.4	3.0
Academic Support	2.1	1.3	1.6	1.1	1.5	1.1
Institutional Support	5.1	3.3	3.6	2.3	3.6	2.5
<i><u>Student Preparedness</u></i>						
SAT verbal 25th percentile	380	37	423	30	417	31
SAT verbal 75th percentile	478	46	529	34	526	36
SAT math 25th percentile	377	38	425	29	420	31
SAT math 75th percentile	479	44	532	30	529	32
N*	959		4,729		2,601	

Notes: HBCUs are just over 5 percent of the full sample. The SAT CEM match is based on the 75th percentile math scores submitted to the institution for enrollment. <sup>1</sup>Pell grants are measured in terms of dollars per full-time equivalent. <sup>2</sup>Endowment is measured in terms of millions of dollars per full-time equivalent. <sup>3</sup>Expenditures are measured in per full-time equivalent terms and in thousands of dollars.

<sup>4</sup>During the coarsened exact matching for the SAT, and Pell/SAT control groups, a select few HBCUs, no more than 6 institutions, were distorting the balancing of the match. We re-estimate these models with those institutions removed. \*Not all variables have data for all years or institutions; N stands for the maximum number of observations; not all variables are reported for all years. Control groups were created using Coarsened Exact Matching and Carnegie Classification's find similar tool. Control groups comprise non-HBCUs only.