# What's in a (school) name? Racial discrimination in higher education bond markets*

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**ABSTRACT**

Historically black colleges and universities (HBCUs) pay more in underwriting fees to issue tax-exempt bonds, compared to similar, non-HBCU schools. This appears to reflect higher deadweight costs of findings willing buyers: the effect is three times larger in the Deep South, where racial animus has historically been the highest. School attributes or credit quality explain almost none of the effects. For example, identical differences are observed between HBCU and non-HBCU bonds: 1) having AAA credit ratings, and 2) insured by the same company, even prior to the Financial Crisis of 2008. HBCU-issued bonds are also more expensive to trade in the secondary market, and when they do, sit in dealer inventory longer.

JEL classification:

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Over 50 years ago, Milton Friedman argued in *Capitalism and Freedom* that economic development deters the expression of discrimination, racial or otherwise. The crux of his argument is that free markets "separate efficiency from irrelevant characteristics," the benefits of which he credits the ability of Jews to survive the Middle Ages, despite intense persecution. Friedman illustrates the intuition behind his argument with an example:

> *The purchaser of bread does not know whether it was made from wheat grown by a white man or a Negro, by a Christian or a Jew. In consequence, the producer of wheat is in a position to use resources as effectively as he can, regardless of what attitudes of the community may be toward the color, the religion, or the other characteristics of the people he hires.*

Friedman's example is persuasive for two reasons. First, bread consumers and wheat growers don't directly interact. Second, because bread is essentially a commodity – contrast this with a fine meal or opera recording – the product itself reflects little about the producer's personal characteristics. Together, these factors effectively anonymize growers, eliminating any but-for influence of consumers' preferences over their personal attributes.

This paper explores a setting that, if Friedman's argument is correct, would seem an even more unlikely venue for racial discrimination: the municipal bond market. As in the wheat example above, the transaction between the "consumer" (a bond investor) and "producer" (a municipality) is intermediated and thus impersonal, and the product (interest payments) is, in the event that it arrives, indistinguishable between payers. These, in addition to the competition endemic in financial markets, should force prices to reflect a bonds' *fundamentals*, and little else.

From 1988-2010, 4,145 tax-exempt municipal bond issues by 965 four-year college and universities were completed, totaling approximately $150 billion. Of these, 102 were issued by historically black colleges and universities (HBCUs), many of which originated in ex-slave states during the Reconstruction Era (1880s), with the mission of educating newly emancipated Blacks. In this paper, we ask whether HBCUs pay more to access capital markets than otherwise similar peers, and if so, why.

We begin by examining higher education municipal bonds at the time they are issued. Like most initial public stock offerings for corporations, financial intermediaries play a prominent role in the issuance of municipal bonds. In the typical arrangement, an underwriter first buys a bond issue from a college or university, and then resells it to public investors in the ensuring days or weeks. This price difference – known as the "gross" or "underwriter" spread – compensates underwriters for their costs related to pricing, preparing legal documents, marketing, and selling the issue.

Our first finding is that underwriter spreads for HBCU-issued bonds are substantially higher than otherwise similar bonds issued by non-HBCUs. Unconditionally, underwriters collect about \$8,050, on average, for every million dollars raised in the municipal market. However, for bonds issued by HBCUs, the underwriter's share is \$9,200. For a typically sized deal (\$35 million), the total difference grows to about \$40,000.

We hypothesize that the high spreads charged of HBCUs reflect, in turn, high selling costs born by underwriters. Indeed, conversations with municipal bond traders (the original source of inspiration for this paper) suggest that bonds issued by HBCUs are particularly illiquid, or in industry parlance, "harder to place." Further, it is perceived that racial animus by potential investors is the source of this illiquidity.

In most financial markets, the ability of investor tastes to influence prices is limited by competition from parties indifferent to such concerns. However, for at least three reasons, the municipal bond market may poorly immunize HBCUs from the impact of racial animus. First, tax motivations and home bias create a highly localized market, with investors usually residing within the same state as the issuer (Schultz (2012)). Second, municipal bonds are disproportionately held by those with high incomes, for whom the tax exemption associated with municipals is most valuable. Further, because the right tail of income is dominated by Whites in the U.S., the racial makeup of potential municipal investors is fairly homogenous. Third, and most importantly, HBCUs are concentrated in the southern U.S., where Black-White racial animus has been, and largely remains, the most severe. In tandem, these factors imply that HBCUs are geographically captive, being forced to sell securities to a less-than-receptive clientele.

While this explanation is consistent with the empirical findings above, there are other reasons bonds issued by HBCUs may be hard for underwriters to sell. For example, characteristics of the bond (e.g., amount, maturity, call provisions), issuer (e.g., credit risk, school quality), or state (e.g., concentration of high-income residents) might influence an investor's willingness to hold a given bond. Because HBCU-issued bonds differ among many of these attributes, it is crucial to account for these in our empirical tests.

Yet, when we augment our analysis to account for these potentially confounding factors, the key result remains stable. For example, including only $state \times year$ fixed effects, which take into account the (potentially dynamic) regional differences economic health, the coefficient on an $HBCU$ indicator is 21 basis points ($p < 0.01$). Issuance characteristics like call provisions, amount raised, and maturity lead to only a modest reduction (19 bps), as does accounting for underwriter (18 bps) or school (16 bps) attributes such as number of students, or giving rates of alumni.

We pay special attention to the possibility that HBCUs may have, or are perceived to have, higher credit risk. For example, we limit the sample of university-issued bonds to those having obtained AAA bond rating from one of the three agencies. Given that *no municipal bond with a AAA has ever defaulted*, focusing on this subset should largely eliminate any role played by credit risk. Yet, among this reduced sample (about 40% of the data), the HBCU effect remains stable at 15 basis points. In the same spirit, we cull together only insured deals, and include fixed effects for each insurance company, thereby effectively comparing HBCU and non-HBCU bonds insured by the same entity. Here too, the coefficient remains stable (17 bps), even if the Financial Crisis of 2008 and afterward is removed (16 bps). All these results are statistically significant at conventional levels.

As a further non-parametric robustness check, we utilize the nearest neighbor algorithm developed by Adadie and Imbens (2006) to match each HBCU issuance with a non-HBCU issuance on various bond, school, and underwriter attributes. We require an *exact* match on state of issuance and credit rating. The result of this exercise confirms our prior findings: underwriter spreads for HBCUs are 21 basis points higher than those for matching non-HBCUs, a difference significant at the 1% level.

The stability of the HBCU coefficient in the above analysis suggests that whatever factors are responsible for the higher gross spreads observed, they appear largely orthogonal school, bond, underwriter, or regional influences. Racial animus is, of course, one such candidate, whereby a HBCU's racial affiliation *per se* makes it less attractive to a rich, largely White clientele residing in the southern U.S. And, while the tests above rule out a large number of observable factors, one may still be concerned about unobservable differences between HBCUs and non-HBCUs.

To address this concern, our next test looks *within* the set of HBCUs, and uses geography to proxy for the prevailing level of anti-Black racial animus. Such comparisons are possible because, as shown in Figure 1, while HBCUs are heavily concentrated in the Deep South, there are exceptions, with HBCUs existing in Ohio, Pennsylvania, West Virginia, Oklahoma, and Missouri. Intuitively, if racial animus is responsible for our benchmark results, the effect should weaken in states with lower levels of anti-Black racial animus (e.g., Delaware), and strengthen in states characterized by higher levels of racial resentment toward Blacks (e.g., Mississippi).

We rank states by various measures of racial animus, including survey responses (e.g., to questions about affirmative action), racially charged Google searches (Stephens-Davidowitz (2014)), and geocoded racist tweets following the re-election of Barack Obama in 2012 (Zook (2012)). The results of such rankings are unsurprising, with Alabama, Mississippi, and Louisiana earning the dubious distinction as having the highest levels of anti-Black racial animus in the U.S. There is a clear structural break between these three and the fourth

(Georgia), a distinction also reflected in the White vote share for Barack Obama in both elections. For example, in 2008 (2012), Obama garnered only 10% (10%), 11% (11%), and 14% (13%) in the above three states, respectively; no other state was less than 23%. Accordingly, we compare the HBCU effect in these three Deep South states to that observed in all others.

The results are remarkable. Outside Louisiana, Alabama, and Mississippi, we estimate that HBCUs pay 10.8 basis points ($p = 0.04$) more in gross spreads compared to non-HBCUs. However, within these three states, which contain only 5% of the total issuance sample but 26% of those related to HBCUs, the HBCU effect is 30.4 basis points ($p = 0.02$), an effect three times as large. The difference between these coefficients is significant, and as before, appears unrelated to school or issuance characteristics. Importantly, among non-HBCUs, the same regional differences are *not* observed: the average gross spreads for non-HBCUs in Louisiana, Alabama, or Mississippi is 82.9, versus 80.5 elsewhere, a trivial difference.

With these results established in the primary issuance market, the paper concludes with a brief look at the secondary market, asking whether HBCU-issued bonds also face higher transactions costs in this setting. Indeed, we find that transactions costs for bonds issued by HBCUs are about 15% higher compared to those issued by non-HBCUs, comparable to the magnitudes observed in the primary market. Further, HBCU-issued bonds tend to sit in dealer inventory 25-30% longer, consistent with intermediaries facing higher search costs to find willing buyers. In addition to providing external validity to our benchmark results using a different sample, note that any effects in the secondary market are independent of the original underwriter. Thus, were one concerned that the HBCU coefficient (in the primary issuance market) reflecting opportunistic behavior by underwriters and/or inexperience by lenders, these are effectively eliminated in the secondary market.

Our paper adds to a large literature on racial discrimination, although in financial markets, the evidence is considerably more limited. Pope and Sydnor (2011) find some evidence of racial discrimination in peer-to-peer lending markets, but conclude that statistical, rather than taste-based, discrimination gives a better account of the patterns. Using data on mortgage lending, Bayer, Ferreira and Ross (2014) find that conditional on a rich set of observables, Blacks and Hispanics are charged higher interest rates. Relative to these and similar studies, perhaps the most significant advantage of our setting is that because timely repayment can essentially be guaranteed, concerns about unobserved heterogeneity among borrowers is largely eliminated.

The remainder of the paper is organized as follows. Immediately following is a brief discussion of HBCUs, followed by a stylized model intended to motivate our empirical tests. Section 3 characterizes the increase in transactions costs (underwriter spreads) faced by

HBCUs when issuing bonds to the public. This section also contains a regional comparison, asking whether HBCUs located in the Deep South pay a particularly high price to access municipal bonds. Section 4 characterizes transactions costs in the secondary market, followed by a discussion of results and implications in Section 5.

# 1 Historically Black Colleges and Universities

Prior to the American Civil War (1861 – 1865), higher education for Blacks in the United States was almost nonexistent. The majority of American blacks were enslaved, and, while a few free blacks were able to attend "white" colleges in the North[1], educational opportunities for blacks in the southern slave states were extremely rare and generally illegal[2].

To combat this inequality, a few institutions were organized during the Antebellum period to offer elementary- and high school-level instruction specifically to black students. In 1837, a group of Philadelphia Quakers started The Institute for Colored Youth. This school would later be renamed Cheyney University and is generally recognized as the first Historically Black College/University (HBCU.) Roughly 20 years later, two other black schools were formed: Lincoln University (Pennsylvania) in 1854 and Wilberforce University (Ohio) in 1856. Although called "universities" or "institutes" from inception, most HBCUs did not offer courses at the postsecondary level until the early 1900s. This was due primarily to the lack of public primary and secondary education for African-Americans – HBCUs were primarily focused on filling this gap.

In the post-Civil War era, the number of HBCUs grew rapidly, often by way of northern religious missionary organizations establishing new institutions in the former slave states. The first of these was Shaw College in Raleigh, North Carolina, founded by Henry Martin Tupper, who had been commissioned the American Baptist Home Mission Society to serve as a missionary to freed slaves in the American South. The creation of many other such institutions shortly followed. Another surge in the number of HBCUs came in 1890, when Congress passed the second Morrill Act. The first Morrill Act (1862) gave federally controlled land to the states for them to sell and use the proceeds to establish and fund "land-grant" colleges. However, most of these schools, especially those in the South, banned black students. The

[1]For example, Oberlin College in Ohio and Berea College in Kentucky both had substantial black student bodies prior to the Civil War.

[2]The first laws prohibiting slave education were passed by South Carolina in 1740 following the Stono Slave Rebellion. Georgia was the next state to pass anti-slave education laws in 1758, with most southern states following suite after Nat Turner's Revolt in 1831. Mississippi went so far as to even pass a law requiring all free blacks to leave the state for fear that they would educate or incite the slave population. See also: Executive Committee of the American Anti-Slavery Committee, Slavery and the International Slave Trade in the United States of America, London: Thomas Ward And Co, 1841, Anti-Slavery collection.

second Morrill Act (1890) attempted to remedy this injustice by requiring states with segregated land-grant colleges to either desegregate or establish a separate land-grant college for students of color. This led to the creation of 16 exclusively black land-grant institutions: a college in each of the southern and southern-border states. In 1896, *Plessy v. Ferguson* (163 U.S. 537) institutionalized segregation in public education with its "separate but equal" doctrine. This led to the expansion of public black secondary schools, allowing HBCUs to shift focus to post-secondary instruction. Despite the Supreme Court's 1954 ruling in *Brown v. Board of Education* (347 U.S. 483) overturning "separate but equal," most HBCUs remained segregated, with poorer facilities and smaller budgets than their "white" counterparts. To remedy this, Congress passed Title VI of the Civil Rights Act of 1964, which ensured equal opportunity in federally assisted programs and activities.

One year later, Congress passed the Higher Education Act of 1965, which defined and provided direct federal aid to HBCUs. This bill defined an HBCU as, "any historically black college or university that was established prior to 1964, whose principal mission was, and is, the education of black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation." Financial support for HBCUs under the Higher Education Act of 1965 was explicitly acknowledged as partial remedy for past discriminatory action by States and the Federal Government against HBCUs. Additional government support for HBCUs came in 1980, when President Jimmy Carter signed Executive Order 12232, "to overcome the effects of discriminatory treatment and to strengthen and expand the capacity of historically black colleges and universities to provide quality education." Subsequent administrations have also signed executive orders supporting HBCUs in various ways.

Despite governmental support of HBCUs, financial backing still remains a top concern for HBCUs in order to sustain their educational mission (Arnett (2014), Gasman (2010)). Figure 1 identifies the 88 four-year HBCUs we study during our sample period. According to the National Center for Education Statistics, in 2010, four-year HBCUs served approximately 251,000 students, 233,000 (93%) of whom were black. This statistic displays the mission of HBCUs to educate blacks, as non-HBCU four-year institutions served 10.751 million students, of which blacks comprised only 1.357 million (or 12.6%). Some notable HBCU alumni include Thurgood Marshall (Lincoln University and Howard University School of Law), Toni Morrison (Howard University), the Reverends Martin Luther King, Jr. (Morehouse College) and Jesse Jackson (North Carolina A&T), Spike Lee (Morehouse College), Jerry Rice (Mississippi Valley State University), and Oprah Winfrey (Tennessee State University).

## 2 A simple model of municipal bond trading

To fix ideas for the empirical tests that follow, we begin with a stylized model of municipal bond trading. The objective is to provide empirical guidance for the tests that follow, with an emphasis on the lack of liquidity in this market, and the central role played by broker/dealers in the price formation and trading process.

There are three dates, $t = 0$, 1, and 2. Assume a risk free rate of zero. Consider a bond with face value \$1, which realizes risky payoffs at $t = 2$. With risk-neutral probability $q$, the $t = 2$ payoff is zero. Thus, with no search costs or other frictions, the price of the bond would be $1 - q$ at all dates.

Dates $t = 0$ and $t = 1$ correspond to a round-trip trade through a broker/dealer, which purchases $Q$ units of the bond at $t = 0$, and sells the same quantity at $t = 1$. Ordinarily, retail customers are the counterparties for broker/dealers at both $t = 0$ and $t = 1$. However, when the bond is originally made public, the counterparty is the initial issuer, e.g., a university or other municipality. The timeline below illustrates the timing.

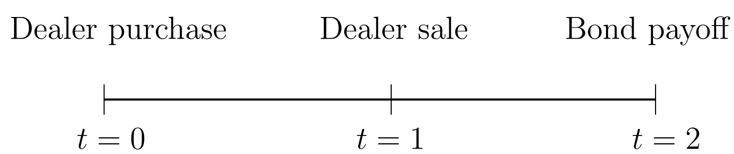


**Figure 1.** Timeline

As noted by Harris and Piwowar (2006), Schultz (2012), and Ang and Green (2011), transactions costs in municipal bonds are among the highest of all financial assets. Round-trip trading costs are on the order of 150-300 basis points, estimates that, as of this draft, approach the annual yield on high grade municipal bonds. A significant reason for such high costs is that participation in the municipal market is severely limited, both for wealth and geographic factors. Accordingly, broker/dealers appear to face substantial search costs matching buyers and sellers contributing, in part, to the high spreads observed in the municipal market.

We model these search costs as follows. For effort level $e > 0$ expended by a broker/dealer, it can place each bond at discount $D(e) = \frac{\gamma^2}{e}$ relative to fundamental value $1 - q$, where $\gamma \geq 0$. Higher effort levels by broker/dealers translate to higher selling prices, and vice versa.[3] The cost of supplying effort is $k + e$, reflecting both a fixed cost and variable cost. Moreover, the returns to underwriter effort increase with $\gamma$, intended to capture search costs related to selling a bond. For example, high values of $\gamma$ might correspond to bonds issued in poor states with few potential investors; alternatively, bonds with high default risk, complex features, or other contractual features that make them unattractive to investors may increase search costs.

Consider the effort choice at $t = 1$ for a broker/dealer, who has purchased $Q$ units of the bond at price $P_{buy}$ at $t = 0$. Profits, $\Pi(e)$, are given by:

$$\Pi(e) = Q[1 - q - \frac{\gamma^2}{e} - P_{buy}] - (k + eQ), \tag{1}$$

which, when optimized with respect to $e$, gives equilibrium effort level $e^* = \gamma$. Bonds with a thick pool of potential investors require little to no discount, and thus minimal effort by broker/dealers; bonds with a thinner potential clientele require larger discounts, which broker/dealers partly mitigate through a higher effort choice. This gives a selling price at $t = 1$ of:

$$P^*_{sell} = 1 - q - \gamma. \tag{2}$$

Backing up to $t = 0$, and assuming competition, we can derive the maximum price a broker/dealer would be wiling to pay by setting $\Pi(e^*)$ equal to zero, which gives:

$$P^*_{buy} = 1 - q - 2\gamma - \frac{k}{Q}, \tag{3}$$

and round-trip transaction cost of

$$P^*_{sell} - P^*_{buy} = \gamma + \frac{k}{Q}. \tag{4}$$

As trade size, $Q$, increases, unit transactions costs decrease as the fixed cost ($k$) is spread over a larger number of bonds.[4]

Throughout the paper, we will use this simple model as a benchmark, and in some cases augment it to incorporate more realistic features of the trading process. As mentioned above, Equation (4) can be applied to trading between retail investors (i.e., the secondary market), as well as when universities issue bonds to the public initially (primary market). We consider

[3]Modeling the search problem with discounts is little more than a normalization. If investors derive consumption value from holding municipals (e.g., from a school's alumni), one could imagine premia relative to fundamental value, which also increase with broker/dealer's effort costs.

[4]Note that the intuition here is robust to allowing less-than-perfect competition in the broker/dealer market.

each of these scenarios separately.

Our central hypothesis is that because of racial animus, selling costs ($\gamma$) are higher for HBCU-issued bonds which, as Equation (4) indicates, will increase transactions costs, and ultimately, HBCUs' cost of obtaining finance. This contention is based on three observations. First, municipal bonds are typically marketed and sold to wealthy individuals, as the tax benefits are most advantageous to those in the highest brackets.[5] Second, the tails of the wealth (Strand (2010)) and income (Altonji and Blank (1999)) distributions are heavily concentrated among White individuals, making it likely that members from this group constitute the typical investor of an HBCU-issued bond. Finally, and perhaps most significantly, municipal bond investors disproportionately reside in the same state of the issuer. As noted by Schultz (2012), such home bias has both behavioral roots (e.g., familiarity for local issuers) and potential tax advantages.[6] Because most HBCUs are located in ex-slave states, it is not simply that broker/dealers must find (mostly) White investors for their bonds, but in regions where racial animus and conflict between Blacks and Whites has historically been the highest.

It is also useful to note what does *not* matter in Equation (4). Specifically, although credit risk ($q$) will matter for bond prices (both $P^*_{buy}$ and $P^*_{sell}$), it nets out in the expression for transactions costs. The same irrelevance would apply to other cash flows characteristics not modeled, such as duration, convexity, call provisions, and so on. Consequently, to the extent that such cash flow features are associated with transactions costs in our empirical analysis, it is because they influence underwriters' placement costs and/or rents. This could occur, for example, if investors have preferences for high-grade municipal bonds beyond their low default risk, similar to the investment grade thresholds faced by many institutional investors. In any event, our empirical tests will attempt to control for the impact of such features on underwriting/placement costs, so that the coefficient of interest – an indicator for HBCU-issued bonds – is estimated beyond these other determinants.

# 3 Do HBCUs pay more to issue tax exempt bonds?

We begin with an analysis of the primary market, exploring whether HBCUs pay more to issue municipal bonds. Subsection 3.1 contains a description of the sample, followed by some institutional background on the underwriting process in subsection 3.2. Our benchmark results are presented in subsection 3.3, which documents that HBCUs pay about 20

[5] As noted by Ang and Green (2011), individual investors comprise the largest set of municipal bond investors. See also O'Hara (2012), Table 1.7, for more discussion of municipal bond investor demographics.

[6] Most states allow interest from municipal bonds to be exempt from state tax (in addition to Federal tax), provided that the investor resides in the same state as the issuer.

basis points in additional fees, compared to otherwise similar issuers. Subsection 3.4 characterizes the geographic distribution of these additional fees, using cross-state variation in racial animus to proxy for the search frictions underwriters may face when attempting to sell HBCU-issued bonds.

## 3.1 Issuance sample

Our sample consists of municipal bonds issued by 4-year and higher, not-for-profit, U.S. colleges and universities. To identify the potential set of such issuers, we begin with the National Center for Education Statistics' Delta Cost Project Database (DCPD). The DCPD is a longitudinal database that provides the name, location, and other schools specific data all postsecondary institutions in the U.S. spanning academic years 1988 through 2010.[7] The DCPD also identifies schools considered HBCUs.

We then obtain bond issuance data via the Security Data Corporation's (SDC) Global Public Finance Database. SDC does not explicitly identify issuances from 4-year and higher, not-for-profit, U.S. colleges and universities, but does provide basic information about the issuance including the general type of issuer, main use of proceeds, amount, term, gross spread, state of issuance, name of issuer and name of the backer of the bond. We therefore combine information from SDC and DCPD to identify bond issuances of interest.

Between 1988 and 2010, there were 7,249 individual bond issuances from tax exempt issuers classified as universities, for which the main use of proceeds is higher education, and for which gross spreads are not missing. We then remove 1,196 observations corresponding to two-year and junior colleges, as indicated by either the issuer or backer name containing variants of the terms "community college," "junior college," and "technical college", and an additional 11 issuances where the backer is denoted "various", corresponding to bonds backed by multiple institutions. Applying these criteria leaves 6,042 issuances.

From this set, we then manually search the backer and/or issuer fields for the names of each HBCU identified in the DCPD. We also search the CUSIP field in SDC for CUSIPs associated with HBCUs.[8] We identify 102 HBCU bond issuances, each of which is listed in Figure 1. Of the remaining 5,940 non-HBCU issuances, we are able to identify specific schools for 4,071 of them, from which we trim 28 due to missing values for student enrollment in the DCPD dataset. Our final sample thus consists of 4,145 bond issuances, 4,043 (102) issuances pertain to non-HBCUs (HBCUs), and representing 920 (45) unique institutions.

[7] Our sample ends in 2010, as this is the most recent school data available in DCPD. Our analysis therefore avoids the detrimental effects of the 2011 enactment of the Parental Loans to Undergraduate Students (PLUS) program, which severely impacted HBCU enrollments (Bidwell (2014)), Johnson et al. (2015)).

[8] HBCU CUSIPs were identified by searching for each HBCU name on the Electronic Municipal Market Access interface (www.emma.msrb.org).

Descriptive statistics are presented in Table 1, where in Panel A, we tabulate the frequency of the 4,145 sample issuances by year and HBCU status. No obvious temporal trend emerges other than the number of issuances overall is larger in the 2000s relative to the 1990s. In the average year, about 190 bond issuances are sold to the public, with about 5 originating from HBCUs. We observe at least one HBCU-issued bond in each year of the sample, with a maximum of 9 issuances in 2004.

## 3.2 Underwriting costs

When universities issue bonds, underwriters are employed to both structure the deal and the market it to investors. Operationally, underwriters are compensated in the form of discounts, i.e., purchasing bonds from the issuer for a price lower than it expects to sell them. As indicated in Equation (4), higher values for search costs will be reflected in a larger spread between purchase and sales prices.

Testing whether HBCUs are charged higher fees thus requires two pieces of information, $P_{buy}$ and $P_{sell}$. While this calculation turns out to be straightforward in secondary market trading (section 4), where buy and sell prices are explicitly reported for each trade, two institutional features complicate the analysis in the primary market. The first is that universities typically issue multiple bonds with varying amounts, maturities, and other features simultaneously (Ang and Green (2011)). As an example, Panel A of Figure 2 reproduces excerpts from the publicly disclosed Official Statement of the June 2006 bond issuance backed by the HBCU Fort Valley State University. Page one indicates a combined face value of \$44,060,000, and on page two, the identities (CUSIPs) and features of twenty individual bonds constituting the package are presented.

For each deal in our sample, we observe the price paid by the underwriter – Seibert Brandford Shank and Co. and AG Edwards in this case – for the *entire series of bonds within a package*. To be explicit with notation, when we refer to underwriter purchases in the primary market, we add a superscript, so that $P_{buy}^{package}$ refers to the price paid for an entire package of bonds. The unit of analysis in the primary market is limited to 4,145 deals listed in Panel A of Table 1. Of these 4,145 deal-level observations, 228 are issued as part of a larger package, so that they share an official statement with at least one other deal. To account for a potential lack of independence within these multi-deal issuances, in all analysis, we cluster the residuals by issuance.

The second issue is that, because they guarantee issuers a fixed payoff of $P_{buy}^{package}$, underwriters must forecast the prices at which these securities can be eventually sold. Known as the "offering" or "reoffering" prices, these prices are publicly disclosed in the official statement at the time of issuance, per MSRB Rule G-32. Offering prices are determined by underwriters, taking into account prevailing yields, the issuer's risk (potentially mitigated by purchasing insurance), the timing and amount of cash flows, call provisions, and other attributes. Importantly, the offering price is not simply a formality: underwriters are compelled by the Internal Revenue Service to "make a bona-fide effort to sell a substantial fraction of the bonds at a reoffering price (Schultz (2012))." Thus, while bonds may ultimately sell for more or less than the offer price, offering prices represent a reasonable approximation of the underwriter's expected proceeds.

Returning to the Fort Valley State example in Figure 2, we see that for each bond CUSIP, both the principal amount and offering yield are reported. For example, CUSIP 704646AA6 represents $70,000 in principal, and is being offered at a price to yield 3.7%. With a coupon rate of 4%, a yield of 3.7% corresponds to a $591 premium to par, resulting in an offering price of $70,591. Other bonds in the series (e.g., CUSIP 704646AV0) are expected to sell at discounts relative to par value. Summing such deviations across all bonds in the series results in an aggregate discount of $843,263, relative to par value.[9] Thus, the offering price for the entire package of bonds is $44,060,000 minus $843,263, or $43,216,737.

To the extent that the offer price is a good approximations for sales price, $P_{sell}^{package} \approx P_{offering}^{package}$, then the difference between offering and purchases prices will provide a reliable estimate for issuance costs:

$$P_{sell}^{package} - P_{buy}^{package} \approx P_{offering}^{package} - P_{buy}^{package}. \tag{5}$$

The quantity on the right is a well-defined quantity in the municipal bond industry: the "gross" or "underwriter" spread.[10] Returning to the Fort Valley State example in Appendix 1, page 62 of the Official Statement, reproduced in Appendix 1, reveals that the underwriter agrees to a purchase price, $P_{buy}^{package}$, of $42,933,342. Relative to the offering price of $43,216,737, the gross spread is $286,395 (circled in the official statement reproduced in Figure 2), representing about 0.66% of the bonds' estimated market value.

For all analysis in this section, we take gross spreads as a reasonable approximation for transactions costs. In later analysis of secondary market trades (Section 4), we will test whether this assumption is reasonable, exploring in more detail any discrepancies between

[9] This is known as the "original issue discount," and is listed on page 62 of the Official Statement. See Appendix 1.

[10] Gross spreads are sometimes further broken down into: 1) *takedown*, which provides compensation for finding buyers, 2) *management fee*, which pertains to structuring and managing the bond issue, and 3) *underwriter expenses*, usually involving compliance and other regulatory functions. In our sample, these separate components of gross spreads are seldom disclosed, although for a small number (245), we find that takedown comprises some 62% of the total. This is consistent with industry data confirming that takedown is typically the largest component of spreads (MSRB 2013).

offering prices and actual sales prices, particularly as they relate to HBCU status. Because this analysis utilizes a different (trade-by-trade level) dataset and empirical methodology, we delay this discussion until the next section. However, to preview these results, we find virtually no differences between HBCUs and non-HBCUs. To summarize, both the fiduciary obligation of the underwriter – i.e., to make a bona fide effort to sell at the offering price – combined with our later findings, indicate that gross spreads capture the vast majority of transactions costs in the issuance market.

Gross spreads are typically referred to in basis points, as a fraction of either the bond's par value or proceeds. We use the latter normalization, but note that because bonds are typically priced close to par, our results are virtually invariant to the choice of scaling. Panel B of Table 1 indicates that gross spreads in our sample of university-issued bonds average about 81 basis points, nearly identical to O'Hara's (2012) estimate for the universe of all municipal bonds issued during this time period.

Continuing down the table, we report summary measures for various other issuance characteristics. In the second row, we see that the average deal is $35 million per year, totaling almost $150 billion over the entire sample. Nearly all deals feature call provisions (90%), a standard feature among municipal bonds. Over half (56%) of the issuances are insured, with 42% securing an AAA rating, 17% a AA ratings, with the balance of deals either rated below AA (14%) or remain unrated.[11] Sinking fund provisions (61%) and pre-refunding (19%) are sometimes used to provide additional protection against default. Virtually all university-issued securities are "revenue bonds," indicating that they are backed by a stream of cash flows originating from a specific asset. For example, in Fort Valley's case, the bond issue pertains to a student housing facility.[12]

The last few rows list summary statistics for underwriters and issuers. For the trailing five years (e.g., for issuances in 1997, considering years 1992-1996), the average underwriter is involved with 22 university-issued deals. As shown in the following row, the typical university has about 10,000 students enrolled, with about 40% being public schools. Giving among alumni averages about $5,000 per student, and again, is highly skewed at the right tails of the distribution.

Our main analysis compares gross spreads between bonds issued by HBCUs and non-HBCUs, while attempting to control for sources of heterogeneity related to school quality, issuer reputation, bond characteristics, geography, and other factors. Accordingly, Panel C presents summary values for each variable for HBCUs and non-HBCUs separately. To

[11] Note from the Fort Valley State example, both the identity of the insurer (Ambac) and credit rating of the issue (AAA) are reported in the official statement for each deal.

[12] The primary alternative is a "general obligation" bond, most often seen among municipalities with taxing authority.

foreshadow our regression results, gross spreads are different by 12 basis points ($p < 0.01$), an increase of fifteen percent relative to average gross spreads for non-HBCUs. However, examining the other variables, some of this may reflect differences in issue size (HBCU amounts are lower), student enrollment (HBCUs are smaller), giving rates (HBCU alumni give less), or underwriters (HBCU underwriters appear less experienced). It is plausible that any of these could increase the risk of the issue or reduce the potential pool of investors, either of which may increase transactions costs for HBCU-issued bonds.

On the other hand, note that HBCUs are much more likely to purchase insurance – 80% versus 55% for non-HBCUs – a finding that explains, in part, their superior distribution of credit ratings. Where 54% (69%) of deals issued by HBCUs are rated AAA (AA or better), these same figures are 41% and 58% for those issued by non-HBCUs. Only 2% of rated HBCU deals have credit ratings lower than AA, compared to 14% for other issuers.

## 3.3 Results

To more formally characterize the difference in gross spreads between HBCUs and other universities, we estimate the following model:

$$\begin{aligned} Gross\ Spread = \alpha_0 + \alpha_1 \cdot HBCU + \beta_1 \cdot Bond\ Characteristics + \\ \beta_2 \cdot School\ Characteristics + \beta_3 \cdot State \times Year\ Fixed\ Effects + \varepsilon \quad (6) \end{aligned}$$

The number of observations is 4,145, one for each university-backed issue in our sample. The main coefficient of interest is $HBCU$, an indicator variable for whether the issuance is from a Historically Black College or University. The coefficient on HBCU, $\alpha_1$, represents the marginal increase in gross spread charged for HBCU-issued bond packages, after controlling for a various school, bond, underwriter, and geographic attributes we expect to be correlated with spreads charged by underwriters. As a benchmark, the first column of Table 2 shows the results when only the $HBCU$ indicator is included as a covariate, essentially replicating the univariate comparison shown in Table 1. Progressive columns sequentially incorporate controls for potentially confounding factors.

### 3.3.1 Temporal and geographic effects

When interpreting the $HBCU$ coefficient, one possible concern is geographic heterogeneity in costs underwriters may face when attempting to sell bonds. Recalling that because of tax motivations, there is strong incentive for municipal bond investors to reside in the same state as the issuer. Consequently, intuition suggests that placing bonds in larger and/or richer states be easier for underwriters, resulting in lower gross spreads. Recalling that HBCUs are regionally concentrated amongst some of the poorest states in the U.S. (Baron (2014)), perhaps the $HBCU$ indicator captures, in whole or part, cross-state heterogeneity in wealth, size, education, or other relevant features of the potential investor base. A second possibility is that $HBCUs$ tend to concentrate their bond issues in times when gross spreads are high (in aggregate).

Both possibilities are addressed by the inclusion of $state \times year$ fixed effects, shown in column 2. As seen by the dramatic increase in $R^2$ from just 0.1% to 54.2%, the fit of the model improves substantially. Moreover, the magnitude on the $HBCU$ coefficient nearly doubles to 21.3 basis points, over four times the standard error of the estimate (5.1 basis points). In the presence of these dynamic geographic controls, the $HBCU$ effect is estimated within the state-year unit, mitigating the impact of state-level wealth, demographics, tax rates, or other similar factors.

### 3.3.2 Issuance characteristics

Although the summary statistics in Table 1 suggest that the contractual features of HBCU-issued bonds are similar in most respects, there are a few differences. In particular, HBCUs tend to raise smaller amounts on average which, recalling the model in the previous section, will distribute the underwriter's fixed costs over a smaller dollar volume. All else equal, this will increase gross spreads for HBCUs.

Column 3 adds to the regression controls for various features of the issue, including the credit rating if one exists (and an indicator for no rating otherwise), insurance, and sinking fund provisions. Most bond characteristics load significantly in the regression, and in ways consistent with prior studies. For example, extant literature documents that transaction costs in bond markets decrease in size, and increase in time to maturity, instrument complexity, and credit risk (Harris and Piwowar (2006)). We too find higher gross spreads for smaller issuances, and/or those with longer maturities, or complex valuation features such as callability and sinking fund provisions. Measures of credit risk (beyond credit ratings, which are already included) also are significant predictors of gross spreads. Uninsured bonds have higher gross spreads, consistent with Butler (2008). Revenue bonds, which are backstopped by the cash flows of particular projects rather than the university as a whole, have higher gross spreads.

However, accounting for these contractual features of the bond issue, while again improving the fit of the model ($R^2 = 63.9\%$), leaves the $HBCU$ coefficient nearly unchanged. Gross spreads on HBCU-issued bonds are almost 19 basis points higher, with a $p$-value less than 1%.

#### 3.3.3 Underwriters

Recall from Panel C of Table 1 that HBCUs tend to use underwriters with less experience, with the typical HBCU underwriter having participated in 15 deals over the prior five years, versus 22 for non-HBCUs. To the extent that such differential experience reflects disparities in operating efficiency or rents, then it is possible that the $HBCU$ effect reflects, at least in part, differences in underwriter selection.

One dimension in which underwriters may differ is operating efficiency. In particular, larger underwriters may have better developed networks of potential investors, and in other ways, likely enjoy economies of scale. The effect of such differences on transactions costs emerge immediately from the model presented in the prior section. We have already seen how fixed cost of underwriting ($k$) maps directly into transactions costs, and extending this to incorporate marginal costs is trivial. Suppose, for example, that underwriter $i$'s effort ($e$) function is given by $h_i^2 e + k_i$, where the marginal cost of selling ($h$) differs across underwriters $i$. In this case, $P^*_{sell} - P^*_{buy} = h_i \gamma + \frac{k_i}{Q}$, so that transactions costs increase in both marginal ($h_i$) and fixed costs ($k_i$).[13] Another potential determinant of gross spreads that may differ across underwriters is market power, a feature we leave unmodeled, but may nevertheless differ between underwriters.

To address such concerns, column 3 adds as a covariate the lagged number of deals for underwriter in the trailing five years, revealing a strong, negative relation with spreads, confirming Butler (2008). Using the reported estimate, an increase from 15 (the HBCU average) to 22 (the non-HBCU average) in recent underwriting experience is expected to decrease gross spreads by about 12 basis points, consistent with larger underwriters facing lower costs. However, note that the coefficient on $HBCU$ remains stable at about 18 basis points, statistically significant at more than the 1% level.

#### 3.3.4 School quality and alumni wealth

Cash flows characteristics aside, suppose that a school's reputation influences an investor's willingness to own its bonds. Though outside most mainstream asset pricing theory, there are two reasons to admit this possibility. The first is Merton's (1987) "investor recognition" hypothesis, which is based on the assumption that investors are unlikely to purchase securities issued by unknown firms. Applied to the municipal context, this assumption would increase underwriters' search costs for lesser-known universities. Given that many HBCUs are small and provincial, this seems like a reasonable possibility.

[13] Of course, with perfect competition at $t = 0$, the underwriter with the lowest cost could capture the entire market. A less stylized model might therefore appeal to incomplete and/or costly information acquisition by issuers, or other frictions that allow heterogeneous suppliers to simultaneously exist in equilibrium.

A second possibility is that investors derive utility directly from owning securities, beyond their financial returns. This assumption forms the basis for the growing class of "socially responsible" funds, which include or exclude certain securities based on a priori criteria such as avoiding defense firms, or investing in green energy companies. Hong and Kacperczyk (2009) explore this idea among equities, documenting that 'sin stocks' – firms involved in the production of alcohol, tobacco, or gambling – tend to be less widely held, and consequently, experience higher returns. Among universities, the idea is even more intuitive, especially among a school's alumni. To the extent that buying a school's bonds confers consumption value directly, search costs may be lower for schools with larger, richer, or more enthusiastic alumni. HBCUs are expected to rank poorly on all three dimensions.

To address this possibility, column 5 shows the results when we augment our specification with various measures intended to proxy for school reputation and/or alumni wealth. (Recall that because our regressions already include *state* × *year* fixed effects, we are testing for wealth differences in university-affiliated clienteles within states.)

The first variable, the logarithm of student enrollment, loads negatively, suggesting that after controlling for the size of the deal, it is easier for underwriters to place bonds issued by larger schools. On the other hand, spreads are about 8 basis points higher for public schools. This is difficult to explain through an alumni channel because all else equal, one would expect graduates of public universities to be more likely to remain in the state, thereby reducing search costs for underwriters. Though speculative, perhaps alumni interest and/or loyalty is higher for private schools, so much so that it outweighs the tax benefits of investing in one's own state. It is also possible that funding uncertainty could be higher for public schools, who are more exposed to fluctuations in tax revenue compared to private schools.

The final three rows of column 5 represent the most direct way to measure the wealth and enthusiasm of a university's graduates: alumni giving rates. Recall that from Table 1, alumni giving rates are missing for about one-third of our sample. In these cases, we include a separate dummy variable for missing data; for non-missing cases, to model non-linearities, we use indicator variables for whether giving was in the first (average giving $767/student), second ($2,836/student) or third ($11,385) tercile.[14] Compared to schools with no data on giving (the base case), schools in the top third are associated with a spread reduction of 10 basis points, and schools in the middle tercile with a reduction of 6 basis points. However, the bottom tercile of schools reporting giving rates are statistically indistinguishable from

[14] In unreported robustness checks, we have experimented with alternative measures of school quality, such as standardized test scores. Because these are highly correlated with alumni giving rates, including both simultaneously leads to a multicollinearity problem. However, an almost identical picture emerges. Because our concern is that a school's alumni constitute a natural pool of potential investors, a measure more closely correlated with alumni wealth is desirable.

those with missing data.

This last comparison is important because as a group, HBCUs tend to rank poorly in terms of giving rates, standardized test scores, and other measures of student achievement. However, because the impact of these variables is concentrated in the right tails – the top giving tercile includes schools like Stanford, Harvard, Yale, and Princeton – their exclusion is unlikely to bias the HBCU coefficient. Indeed, comparing the fifth and sixth columns, despite many of the school variables being strong predictors of gross spreads, the impact on the $HBCU$ coefficient is trivial. With the full family of controls for time, geography, contractual features, underwriter activity, and school characteristics, historically Black colleges and universities are charged about 16 basis points more to issue bonds, an increase of about 20% relative to the average gross spreads of non-HBCU issuers.

### 3.3.5 Credit risk

This section deals more specifically with the possibility that HBCU-issued bonds have, or are perceived to have, elevated credit risk, either through higher default or lower recovery rates. Provided that the market for high-quality bonds is deeper, transactions costs should be lower. Given that we have already accounted for credit ratings in our analysis, perhaps remaining concern over differential credit risk may stem from the pool of unrated HBCU issuers, which comprises about 29% of the sample.

Note that in addition to credit ratings, many of the control variables in columns 2-5 are proxies for credit risk. For example, bond insurance is associated with lower gross spreads, and revenue bonds, which are backstopped by the cash flows of particular projects rather than the university as a whole, have higher gross spreads. However, in columns 6-8, we provide more explicit evidence that the $HBCU$ coefficient is unlikely to represent poor creditworthiness.

Column 6 begins by considering only the subset of bond issuances that receive a credit rating of AAA at issuance. In a comprehensive study of municipal bond defaults from 1970-2011, Moody's *failed to find a single case of default among AAA-rated issuers*, a remarkable fact by any standard.[15] Despite cutting the sample by more than half, the estimated coefficient on $HBCU$ remains stable at about 15 basis points. The reduction in statistical significance ($t = 2.02$) is due almost entirely to reduced precision due to a smaller sample size ($4.7 \times \sqrt{\frac{4145}{1729}} \approx 7.2$).

To further rule out differential credit risk between HBCUs and non-HBCUs, column

[15]Performance among AA-rated issuers was almost as spectacular, with 10-year cumulative default rates of 0.01%. Note the consistency here with recent work by Ang, Bhansali, and Xing (2014), which finds that credit risk explains only 2-4% of the variation in municipal bond yields.

7 includes only insured bonds, and includes insurer fixed effects. Accordingly, the average $HBCU$ effect is identified by comparing gross spreads for HBCUs and non-HBCUs commonly insured by the same entity. Here too, we observe a nearly identical magnitude as before, with gross spreads for HBCU-issued bonds being 17 basis points higher ($p < 0.01$). Lest one be concerned about bond insurance being less credible during and after the Financial Crisis of 2008, column 8 repeats the specification, but only for years 2007 and prior. Again, the coefficient and statistical significance remains virtually unchanged.

Before proceeding, it is useful to reflect on the collection of OLS estimations in Table 2. If the HBCU coefficient simply captured bond or school characteristics, we would expect attenuation of the the HBCU coefficient as control variables are progressively added. Instead, we observe that the key coefficient is stable across specifications. This is also true in a subset of observations intended to further account for credit risk. Both suggest that the effect we document has little to do with standard observable traits of the bonds or the school.[16] A remaining concern, then, is that the functional form of the control variables we employ in the OLS specifications is insufficient.

#### 3.3.6 Matched pair analysis

As a non-parametric alternative, we utilize a nearest neighbor matching estimator for treatment effects (Abadie and Imbens (2006)). We take HBCU status as the treatment, and attempt to match each HBCU issue to a non-HBCU, using each covariate in Table 1 that differs, on average, between HBCUs and non-HBCUs. In addition, we pay particular attention to geographic clienteles and credit risk, requiring *exact* matching for state and credit rating for each HBCU-issued bond package.

Successful matches were obtained in 69 cases. In the first two columns of Table 5, we tabulate descriptive statistics for the match variables, from which trivial differences are observed. Formal covariate balance assessment, shown in columns 3 and 4, reveals standardized differences close to zero, and variation ratios close to one for the majority of covariates.

The estimate of average treatment effects on the treated ($HBCU$), after bias adjustment for continuous covariates (Abadie and Imbens (2011)), is 20.7 bps ($p < 0.01$), nearly identical to the linear estimates shown in Table 3. Obtaining such similar results in this reduced sample mitigates concerns over functional form, and reaffirms the magnitudes of the OLS estimates. Moreover, were one concerned that the HBCU effect simply captures differences in school name recognition and/or reputation, the small sample analyzed here makes it

[16] It is also noteworthy that when we select for firms with low credit risk in columns 6-8, various proxies for credit risk like the presence of a sinking fund, indicators for being a revenue (versus general obligation) bond, and school characteristics are no longer significant.

feasible to directly observe the identities of schools serving as controls. Table A2 in the Appendix tabulates the identities of control schools for HBCUs by state. Generally, non-HBCU controls are small, regional, and relatively obscure, e.g., Villa Julie College (MD), Carlos Albizu University (FL), Agnus Scott College (GA), and Berry College (GA).

## 3.4 Geographical variation in racial animus

To this point, our analysis has found that: 1) HBCU-issued bonds pay more in gross spreads compared to otherwise similar schools, and 2) various controls for creditworthiness, bond features, underwriter quality, geographic variation, and school/alumni quality provide a poor account of this finding. In studies such as this, the conclusion of taste-based discrimination is a diagnosis of exclusion. In this section however, we hope to do better, providing a stringent test that we believe provides stronger evidence that racial animus is, at least in part, responsible for the patterns we observe.

Whereas all the analysis in the prior section compared gross spreads for HBCUs and non-HBCUs – and thus remain open to generic criticisms about unobserved heterogeneity between these groups – our tests in this section compare gross spreads *within* the family of HBCU-issued securities. More specifically, we first measure cross-state differences in racial animus against Blacks, and then, ask whether HBCU-issued bonds in the worst offending states have even higher gross spreads, compared to HBCUs in locations with less racial animus. Given that HBCUs everywhere rank poorly in terms of student achievement, standardized test scores, and other observables, it seems unlikely that such differences within the HBCU universe could generate meaningful differences in underwriting spreads.

Using cross-state differences to measure racial animus is possible for two reasons. The first, noted previously, is that municipal bond investors have a tax incentive to hold local issuers (Schultz (2012)). Second, racial animus varies substantially by state (Stephens-Davidowitz (2014)), even within the South and southeast U.S., the primary location of most HBCUs.[17] Together, these factors suggest that if racial animus is responsible for the gross spread differential documented earlier, then we should observe larger gross spreads in states with relatively higher racial animus.

To measure variation in racial animus across states, we derive a composite of four variables. The first two metrics, racial resentment and opposition for affirmative action, are derived from the Cooperative Congressional Election Study (CCES, Ansolabehere (2010)). The CCES is a large survey of American adults by county, and recent research links current

[17] Other recent studies also exploiting cross-state variation in racial animus to study taste based race discrimination with respect to wage differentials faced by blacks (Charles and Guryan (2012)) and differential access to credit card financing by black entrepreneurs (Chatterji et al. (2013)).

variation in racial resentment and opposition for affirmative action to geographic variation in slavery in the year 1860 (Acharya et al (2014)). The third measure captures state level variation in racially charged Google searches, which, as shown by Stephens-Davidowitz (2014), inversely predict state-level vote shares obtained by Barack Obama in both the 2008 and 2012 elections. The final metric follows Zook (2012), and captures the geographic dispersion of geocoded racist Tweets in immediate response to Barack Obama's re-election in 2012.

We rank all 50 states, in addition to the District of Columbia, on each metric from 1 (highest) to 50 (lowest). We then designate states ranking in the top 10 on each of the four metrics as "high racism" states. Table 4 provides the complete ranking of all states, from which a structural break separating Louisiana, Mississippi and Alabama from the rest is clearly apparent. As a validation of our measure, note that these are (by far) the three states with the lowest White share for Barack Obama in the 2008 (2012) election, with 14% (13%), 11% (11%), and 10% (10%), respectively (Tilove (2008)). Table 1 reveals that while these states account for only 4.7% of all issuances, they are home to over one-fourth of issuances by HBCUs.

Panel A of Table 5 displays the average gross spread by HBCU status, and whether the school is located in a high racism state or not. Importantly, note that non-HBCUs pay similar gross spreads regardless their location (83 basis points in high racism states) or not (80 basis points). However, the same comparison among HBCUs reveals large differences. In high racism states, gross spreads for HBCUs are almost 106 basis points, exceeding by 23 basis points ($p < 0.01$) the spreads paid by non-HBCUs. Outside Louisiana, Mississippi, and Alabama, there is still a difference (87 versus 80 basis points), but it is smaller and not statistically significant ($p = 0.23$).

To formally test for these differences, we re-estimate our standard model, separately for high and low racism states, respectively. Panel B of Table 5 reveals an HBCU effect of about 11 basis points ($p = 0.03$) in low racism states, which nearly triples (30 basis points, $p < 0.01$) among high racism states.[18] Note that as in Table 3, control variables strengthen, rather then weaken the HBCU effect. A one-tailed test for equality of the $HBCU$ coefficients across specifications is rejected at the 3% level.

Observing that these regressions control for the same location, temporal, school, credit, and bond characteristics as in our benchmark analysis, we take the findings in Table 5 as fairly strong evidence of a causal relation between racial animus and placement costs. It is, however, possible that remaining unobserved heterogeneity between HBCUs and non-HBCUs could be different between high- and low-racial animus states. For example, beyond our controls for ratings, insurance, and school characteristics, perhaps residual credit risk between HBCUs

[18] All bonds in the high-animus sample are revenue bonds, so that the indicator drops out of the estimation.

and non-HBCUs is higher in (say) Mississippi compared to Kentucky. Similar arguments could be made for school prestige, or use of high-cost underwriters.

While possible, two observations make this argument less plausible. First, the size of the effect is very large: unobserved cross-state HBCU/non-HBCU heterogeneity would have to generate differences in the range of 20 basis points, or a full one-quarter of the mean gross spread. Second, comparing panels A and B in Table 5, note that the inclusion of control variables strengthens, rather than weakens the disparity between HBCUs and non-HBCUs. Following the arguments developed in Altonji, Elder, and Taber (2005), it is difficult to believe that variation in remaining heterogeneity could be generate the observed findings.

# 4 Secondary market trading

The analysis in the prior section dealt exclusively with transactions costs in the primary market, i.e., when bonds are first sold to the public. Here, we explore whether HBCU-issued bonds incur similar discounts in secondary market trading, occurring months to years after issuance. In addition to providing out-of-sample robustness in a different sample, this analysis allows us to directly test a key assumption in the last section, namely that gross spreads are a good approximation for underwriters' transactions cost. It also examines a setting removed from the bond's initial underwriter, allowing us to infer whether unobserved differences in underwriter quality and/or market power contribute to our findings in the primary market.

## 4.1 Data

Transaction-by-transaction trade data were obtained through the Municipal Securities Rulemaking Board (MSRB). Our sample begins in January 31, 2005 and ends in June 30, 2010.[19] We remove 5,705 duplicate trades, and winsorize price changes at the 1% and 99% levels. Moreover, we retain only trades pertaining to bonds in our original issuance sample, and further exclude dealer-to-dealer transactions, leaving only trades in which retail customers are a counterparty.

We use two mutually exclusive secondary trade samples. Sample 1 applies to newly

[19] Although some trading data is available beginning in 1999, traders lacked uniform access to real-time prices until MSRB Rule G-14 took effect on January 31, 2005. Bond prices provide important information for investors, which in turn facilitate trading volume and liquidity in the secondary market (Bessembinder et al. (2006)). Prior to Rule G-14, bonds that traded relatively infrequently (such as HBCUs) were more prone to delayed reporting of trade information. This delay potentially generates a differential information environment for HBCUs relative to other bonds, in turn clouding inferences with respect to secondary market trading prior to January 31, 2005.

issued bonds, so as to examine the initial placement of bonds to retail investors. Because MSRB data does not provide the identity of each underwriter, it is not possible to precisely trace the full depletion of initial bond inventory into the hands of the ultimate investors. Accordingly, in Sample 1 we follow the approximation in Schultz (2012), and examine trades starting twenty-five days before the issuance date, the so called "when issued" period, and ending ten days after the issuance date. In Sample 2, we seek to study seasoned trades. To help ensure we are not examining trades pertaining to an initial issuance, we follow Cestau, Green, and Schühoff (2013) and examine trades occurring beyond 60 days after issuance. Summary statistics for both samples are discussed in the relevant sections below.

## 4.2 "Markups" in newly issued bonds

In Section 3, we found that gross spreads charged by underwriters for HBCU-issued bonds were about 15% higher than those observed on otherwise similar bonds. However, recall that gross spreads are an *ex ante* approximation of the issuance costs, based on the underwriter's expectation of the eventual selling price. For any given transaction however, bonds may sell to the public for more or less than the underwriter's expectation. When they sell for more (less), the issue is initially underpriced (overpriced), resulting in a wealth transfer from issuers (underwriters) to underwriters (issuers).

Mathematically, this is easy to see by decomposing the underwriter's realized revenue, $P_{sell}^{package} - P_{buy}^{package}$ as follows:

$$P_{sell}^{package} - P_{buy}^{package} = \big(\underbrace{P_{sell}^{package} - P_{offering}^{package}}_{markup}\big) + \big(\underbrace{P_{offering}^{package} - P_{buy}^{package}}_{gross\ spread}\big). \tag{7}$$

The second term is the gross spread, familiar from last section. The first term, known among municipal bond traders as the "markup," measures the difference between the offering price and actual sales price. If markups are close to zero, then gross spreads are reliable estimates of underwriter revenues. However, nonzero markups imply that underwriter revenues may be less, in the case of underpriced issues, or more (overpriced) than the gross spread. The analysis in the last section essentially assumed that markups could safely be ignored. In this section, we evaluate that assumption.

Before proceeding, note that because we are interested in any *differential* transactions costs faced by HBCUs versus other institutions, it is not necessary that the average markup is zero. Although this would be sufficient, the necessary condition is that markups for HBCU bonds do not systematically differ from markups for bonds issued by non-HBCUs. As long as $P_{sell}^{HBCU} - P_{offering}^{HBCU} \approx P_{sell}^{non-HBCU} - P_{offering}^{non-HBCU}$, then differences in gross spreads between

HBCUs and non-HBCUs will capture differences in their actual transactions costs.

To measure markups, we utilize the first of the two trade-level datasets described above, pertaining to trades occurring in a thirty-five day (-25 to +10) window around bond issuances. Panel A of Table 6 contains summary statistics. The first five rows refer to measures recording at the trade-level. $Markup$ is defined as the percentage change relative to the offering price,

$$Markup = \frac{P_{sell} - P_{offering}}{P_{offering}},$$

expressed in basis points. Note that markups are calculated at the trade level, in contrast to gross spreads, which are observable only at the package level. As shown in the first row, the average trade is associated with a markup of 130 basis points, suggesting that part of the underwriter's compensation comes through underpricing. Average markups can also be inferred by comparing the next two rows, which show the average $Offering\ Price$ (\$99.78 per every \$100 of par value) and $Sales\ Price$ (\$101.06). The next two rows show that the typical trade size is about \$280,000, occurring, on average, three days after the bond's issuance.

Remaining control variables are measured at either the bond (rows six and seven),or issuance level, presented in rows eight and below. Compared to Table 1, issuance characteristics are generally comparable, but now defined at the transaction level, observations are weighted toward larger issuers. Accordingly, credit ratings are somewhat higher, underwriters have more experience, and schools are slightly larger.

Panel B of Table 6 contains the results of three regressions. In the first, the dependent variable is $Markup$, defined at the transaction level. Issuance-level controls are essentially the same compared to the gross spread regressions shown in Table 2, the two exceptions being that maturity and par amount are now defined at the bond, rather than issuance level. In addition, trade-level covariates include the par value of the transaction, and the time since the offer date.

Examining the coefficients in the first columns, markups are strongly related to trade size ($t = 12.2$) and days on market ($t = 6.8$), with larger and/or more quickly sold bonds having lower markups. Both results are consistent with Schultz (2012) and Cestau, Green, and Schrhoff (2013). To a lesser extent, maturity and call provisions also appear to influence markups.

The coefficient of interest is that on the $HBCU$ indicator. The point estimate (1.74) is about 15 times less than the standard error of the estimate, suggesting no statistically significant difference in markups between HBCUs and non-HBCUs. Further confirmation can be inferred from the second and third columns which, respectively, model $Offering\ Prices$ and $Sales\ Prices$ as a function of the same determinants. In both cases, the coefficient on the $HBCU$ indicator is far from significant.

Together, the patterns in Table 6 suggests that although markups are positive on average (though this is dominated by smaller trades and those occurring several days beyond the issuance date), the similarity between HBCUs and non-HBCUs indicates that, at least for relative comparisons, gross spreads are likely to be sufficient. Therefore, the differential magnitudes reported in the Section 3 would appear a reasonable approximation to the additional costs of finance faced by the average HBCU.

The non-results for sales and markups are interesting for an additional reason. Recalling Equation (7), gross spreads and markups are substitutes. Importantly however, although gross spreads are observable by borrowers – and therefore subject to negotiation – prior to issuance, markups are both non-trivial to measure (requiring analysis similar that reported in Table 6), and in any case, are observed only after the issue has been sold. Thus, by lowering offering prices, an underwriter could inflate markups and simultaneously deflate gross spreads, all the while holding underwriter revenue, and therefore cost to the school, constant.

If the concern were unscrupulous underwriters systematically preying on HBCUs by obscuring the relevant costs, we would expect to find *similar* gross spreads, but *dissimilar* markups and/or offering prices. Yet together, the findings in Tables 2 and 6 clearly reject this possibility. Instead, underwriters appear to charge HBCUs a premium for placing their bonds to investors, but make these additional costs transparent.

## 4.3 Trading costs

Given that HBCUs appear to face elevated costs to issue bonds in the municipal market, it is natural to wonder whether transaction costs for seasoned bonds – traded months to years after issuance – are higher as well. Just as underwriters bear costs related to selling newly issued bonds, broker/dealers must find willing buyers for bonds recently sold on the secondary market. Moreover, one might conjecture a more challenging search problem in the secondary market; whereas underwriters have weeks or even months to market market new bond issues, broker/dealers typically seek to place bonds within a day or two of purchasing them.

To explore these issues, we analyze transactions costs for a sample of seasoned bonds traded on the secondary market. Our workhorse model is adapted from Cestau, Green, and Schürhoff (2013), which tests for, and finds, elevated transactions costs of Build America

Bonds, relative to other tax-exempt municipal bonds. We instead test for elevated transaction costs for HBCUs relative to non-HBCUs among university-issued bonds, and apply their model to our setting as follows:

$$\Delta P_i = \beta_0 + \beta_1 \Delta Tradesign_i + \beta_2 \Delta Tradesign_i \times HBCU + \beta_3 HBCU + \Gamma Controls_i + \varepsilon_i \quad (8)$$

Each observation $i$ is a trade. For each trade, we calculate a percent price change, $\Delta P_i$, relative to the most recently recorded price for the same bond. Prices are scaled by the par value of the trade size.

$Tradesign_i$ takes a value of one for a customer purchase, a negative one for a customer sale, and zero otherwise. Trading costs for municipal bonds are therefore measured by the coefficient $\beta_1$, with a roundtrip trade from one retail client to another incurring a total percentage wise transaction cost of $2\beta_1$. We are primarily interested in the coefficient $\beta_2$, which captures the marginal increase in trading costs for HBCU-issued bonds. In addition to trade direction, we also include $state \times year$ fixed effects, and allow consecutive trade prices to vary with the same set of bond and issuance characteristics included in prior tables. Comparison of issuance characteristics between the newly issued (Panel A of Table 6) and seasoned (Panel A of Table 7) samples are very similar.

Panel B of Table 7 shows the regression results. In the first column, the coefficient on $Tradesign$ is 0.93, nearly identical to the magnitude (0.88) documented by Cestau, Green, and Schürhoff (2013) for tax exempt municipal bonds. In the second column, we add an indicator for $HBCU$, as well as its interaction with $Tradesign$. On the interaction, we estimate a significant coefficient of 0.134 ($t = 2.62$), which remains virtually unchanged in the presence of various issuance and bond characteristics (column 3). Taking the latter estimate as the most informative, trading costs for HBCU-issued bonds are roughly 15% ($184 + 26 = 210$ versus 184 basis points) higher compared to other university-issued bonds.

The final three columns present the results when broken down by trade size. Recall that the model presented in Section 2 predicts that larger trades should be associated with lower transactions costs per dollar. Indeed, we saw evidence of exactly this in the primary market, and a refrain in columns 4-6. For trades less than $25,000, round-trip costs are about 220 basis points, declining to 158 for trades in the $25,000-$100,000 range, and again to 78 for trades exceeding $100,000. Thus, for the average bond, the intuition that fixed costs become diluted as trade size increases appears to have merit.

Especially against this backdrop, what is more interesting is that the HBCU interaction coefficient, $\beta_2$, behaves in exactly the opposite fashion. For very small trades, HBCU-issued bonds are not any more expensive to trade than any other bonds, although the point estimate is still positive at 0.084. However, the coefficient estimate doubles to 0.170 ($t = 2.93$) in the intermediate range of trade size. For trades over $100,000, HBCU-issued bonds are almost 60% more expensive to trade (78 basis versus 122 basis points), compared to their counterparts not issued by HBCUs.

What mechanism can account for these findings? Recall that in the simple model presented in Section 2, discounts $D$ were inversely related to underwriter effort $e$, and varied directly with $\gamma^2$, a bond-specific scaling parameter intended to capture search costs. As $\gamma$ increases, selling for the same discount requires higher underwriter effort.

However, in this benchmark case, there is no notion of "saturation," whereby search frictions become increasingly expensive as trade volume increases. Rather, the relation between effort costs and discounts is identical, regardless of the trade (or placement) size being small, medium, or large. This would be realistic if the pool of potential investors is very large, relative to the volume of bonds needing to be sold.

This will not be so if the number of potential buyers is small, as we hypothesize may be the case for HBCU-issued bonds. After the first few bonds are sold, an already small pool of potential investors becomes depleted, making it proportionally more costly to find a willing buyer for the next. As a simple extension to the model, suppose that the discount for HBCU-issued bonds is $\hat{D}(e) = \frac{\gamma^2}{e}Q^2$, so that for higher trade sizes ($Q$), higher discounts are required. In this case, transactions costs become

$$\hat{P}^*_{sell} - \hat{P}^*_{buy} = \gamma Q + \frac{k}{Q}, \tag{9}$$

reflecting both the diminishing effect of fixed costs ($\frac{k}{Q}$), as well as the increasing effect of larger trade size ($\gamma Q$). Both effects are apparent in the last three columns of Table 7, consistent with the idea of HBCU-issued bonds having a relatively limited, and quickly saturated potential pool of investors.

## 4.4 Yields and inventory time

The analysis in the preceding subsection indicates that when HBCU-issued bonds are traded in the secondary market, the spread between purchases and sales by broker/dealers is about 20 basis points higher than for non-HBCU securities, indicating higher transactions costs. Here, we take a closer look at these round-trip trading frictions, examining bond yields for dealer purchases and sales in separate regressions. Besides providing a complementary perspective to the results when aggregate to the round-trip trade level, this analysis allows us to observe whether HBCUs are sold at discounts, or whether broker/dealers eventually find investors willing to pay prices consistent with observed fundamentals.

Returning briefly to Panel A, we see that on average, dealers purchase bonds for higher yields (lower prices) compared to when they sell them (lower yields and higher prices). On average, this difference is 4.37-4.27% = 0.1%, implying a percentage price change of about 2%, nearly identical to the round-trip percentage cost implied by Panel B.[20] Note also from Panel A that the number of purchase and sales transactions do not match, with the latter (204,140) far exceeding the former (113,426). This reflects the fact that broker/dealers buy in large increments, and in turn, sell in smaller increments.

The first two columns of Panel C take as the dependent variable the yield on bonds purchased by broker/dealers in our sample. In univariate comparisons (column 1), the average yield on an HBCU bond is estimated to be 0.37% higher than that on a non-HBCU bond, a difference settling to 0.25% ($t = 1.97$) when controls for regional, time, credit, school, and bond characteristics are added in column 2. For sales yields (columns 3 and 4), although we estimate a positive point estimate on the $HBCU$ indicator, neither the model with or without control variables indicates a statistically significant relation. Note the consistency here with the primary market: in both cases, financial intermediaries purchase HBCU-issued bonds for substantial discounts, but eventually place them with investors wiling to pay (at least close to) fair value, as implied by credit, bond, and school characteristics.

Recall that in the model presented in Section 2, the discount for difficult-to-place bonds is higher for dealer purchases compared to dealer sales, because the purchase price takes into account, ex ante, the dealer's expected search costs.[21] Our working hypothesis is that broker/dealers find it costly to find willing buyers for HBCU-issued bonds – that they eventually do explains the large purchase discount, and the absence (or near absence) when bonds are eventually sold. Although we do not directly observe costs incurred by broker/dealers, we gain some insight into this issue by examining the time a bond is held in inventory between purchases and sales. Intuitively, bonds with fewer potential buyers should – for a given yield – take longer to sell.

In columns 5 and 6, we test the conjecture that HBCU-issued bonds sit in dealer inventory longer than other issues. Of the 113,426 bond purchases in our sample, we were able to measure inventory time for 71,277 of them. As shown in Panel A, the average bond sits in

[20] Because the approximate percentage price change from a yield difference of $X$ is $DX$, where $D$ is the bond's duration (20.84 years on average for our sample), a 0.1% difference in yield corresponds to a price change of roughly 2%. This is very similar to that indicated by twice (round trip trade) the estimated coefficient on $Tradesign$ of 190-195 basis points, in Panel B of Table 7.

[21] It also predicts discounts (albeit smaller) for sales which, although very weak statistically, is consistent with the positive point estimates on the $HBCU$ dummy in columns 3 and 4.

inventory 4.47 days, although this is highly right-skewed, as indicated by the median investors time of a single day. In the fifth column, we estimate a significant coefficient on the $HBCU$ indicator of 1.20 ($t = 2.72$), which strengthens slightly to 1.31 ($t = 2.85$) in the presence of bond and school controls. Given non-HBCUs average 4.35 days in inventory, HBCU-issued bonds' holding times are about 30% longer, consistent with dealer search efforts successfully finding a favorable price for HBCUs.

# 5 Discussion

## 5.1 Discounts at sale: the dog that didn't bark

In standard tests of discrimination, researchers typically compare differences in an observable outcome, such as wages or promotion rates and, after attempting to control for heterogeneity between the group thought to be discriminated against and the control, assign any residual differences to discrimination. In the current context, perhaps the most obvious outcome is the *price* at which bonds are sold to investors. Yet, in the analysis of both the primary and secondary markets, a consistent picture emerges: HBCU-issued bonds ultimately are sold for prices that, conditioned on observables such as credit risk, are indistinguishable from bonds issued by non-HBCUs.

Naively, this non-result would seem inconsistent with HBCUs facing a "discrimination discount" in the bond market. However, such a conclusion would be premature. When a sale occurs, this is conditional on underwriters having found a willing buyer, and accordingly, having incurred the required search costs. In equilibrium, discounts on sold bonds may end up being small, with HBCU-issued bonds being held by those relatively indifferent to the racial affiliation of HBCUs. However, this does not imply that frictions to external finance are no higher for HBCUs, but rather that underwriters are fulfilling their obligations to them, and being compensated accordingly.

In this way, our results are related to Becker's (1957) original study of the effects of discrimination in labor markets. Becker theorized that the equilibrium impact of discrimination will be reflected by the *marginal*, rather than *average* level prevailing in the market. In our setting, this implies that observed prices (or yields) on sold bonds reflect the racial preferences of the marginal, rather than average, investor. Apparently, search costs associated with placing HBCU-issued bonds is sufficiently low, such that the marginal investor ends up paying close to fair value. If they were higher, we might expect to find larger discounts on sale.

## 5.2 Magnitudes

The analysis in Section 3 suggests that on average, HBCUs pay roughly 20% more in issuance costs. However, for at least two reasons, these estimates are likely conservative. First, recall from Panel C of Table 1 that the vast majority (80%) of HBCU-issued bonds are insured, far higher than non-HBCU issuers (55%). Without cost data, we cannot quantity the additional burden this (near) requirement imposes on HBCU. However, we simply note that while for non-HBCUs, the negative coefficient in Table 2 indicates substitution between insurance costs and gross spreads, for HBCUs, they are approximately additive.

A second reason is that our sample is, of course, conditional upon successful issuance. Out of 88 four-year HBCUs in our sample, 45 are observed to have issued at least one bond during our sample, leaving 43 non-issuers. Using the most recent enrollment and tuition figures from the White House Initiative on HBCUs, we observe that issuing HBCUs are larger than non-issuers. The average tuition and fee revenue (enrollment) of issuers approximated $44 million (11,000 students) versus $20 million (8,400 students) for non-issuers. This evidence suggests that smaller and/or poorer HBCUs simply do not access public debt markets. If racial animus costs disproportionately influence these schools, discrimination could play a role in limiting financing options for the very schools who may be particularly in need of financing (Gasman 2010). Because these are not included in our analysis, the true cost of racial animus in credit markets is even higher.

To put the effects we are able to measure into context, we take 20 basis points as the average estimate of the difference in gross spreads between HBCUs and non-HBCUs. Using par value issued as a base, we can translate these effects educational terms. HBCUs issued $2.6 billion in par value from 102 issuances. This translates to roughly $5.1 million that HBCUs would have otherwise received at issuance absent the effects of racial animus. Given the average institutional student grant in the year 2000 - roughly the midpoint of our sample - at an HBCU is $3,700 (Pravasnik and Shafer (2004), Table A-64), one way to view the discrimination discount is the equivalent of 1,392 students receiving grants. Alternatively, the average faculty salary at an HBCU is roughly $45,600 in 2000 (Pravasnik and Shafer 2004, Table A-64), equating to 113 faculty members. It is of course difficult to quantify the benefits that would accrue from more HBCU student and faculty support, if HBCUs did not bear costs of discrimination. These lost benefits are also not quantified in our analysis, but if such benefits are important, it begs the question of how the discrimination discount might be eliminated.

## 5.3 The potential role of institutions

The key friction proposed to explain our findings operates at the level of the retail investor. Indeed, because individuals constitute the largest single group of municipal bond holders in our sample, a collective preference against investing in HBCU-issued bonds could plausibly impact bond yields, transactions costs, etc.[22] An apparent question is why demand by institutional clients – with behavior presumably less influenced by behavioral biases – doesn't eliminate the search problem faced by underwriters (in the primary market) or broker/dealers (in secondary market trading). Indeed, in the finance literature generally, mis-pricing is typically reduced among securities more concentrated in the hands of institutional clients.

Data availability limit the scope with which we can address this question, as we do not observe the fixed income holdings of most institutional investors and/or hedge funds. Still, to gain some insight into the potential role played by institutional investors, Table 8 compares the regional distribution of college-issued bond supply, to the regional distribution of bond demand for the same set of securities. For this exercise, our measure of institutional investors is limited to insurance companies whose fixed income positions are recorded in the National Association of Insurance Commissioners (NAIC) holdings database, for the years 2001-2010.

The table is organized as follows. For each year from 2001-2010, we begin by aggregating all positions in any of the college-issued municipal bonds among our set of 4,145 issuances, across every insurance company in the NAIC dataset. Then, using school location, we calculate the fraction of total supply originating from each state, for non-HBCUs and HBCUs separately. For example, columns 2 and 3 indicate that insurance companies, on average, own \$89.95 million in notional value of bonds issued by non-HBCU colleges in Georgia, corresponding to 2.38% of the (average) total amount of college-issued bonds held. Likewise, column 3 indicates that Georgia-based HBCUs account for \$13.45 million, for 0.36% of the total. Unsurprisingly, college-issued bonds are concentrated among large states and/or those with large numbers of universities.

Columns 4 through 6 present the data from a complimentary perspective, showing the dollar and percentage breakdowns for the insurance company portfolios domiciled in each state. Continuing with the state of Georgia, the sum of columns 4, 5, and 6 indicate that on average, Georgia-domiciled insurance companies invested, on average, \$9.90 million dollars in any of the college-issued bonds constituting our sample. Of this, \$8.17 (72.94%) was invested in college-issued bonds outside of the state of Georgia (e.g., the University of Texas, or University of Southern California), with the remaining \$1.73 million invested in Georgia-

[22] In 1990, 55% of municipal bonds were owned directly by households, with another 18% owned by mutual funds on their behalf. Source: O'Hara (2012).

based non-HBCU schools, such as Georgia Tech University of University of Georgia. No insurance company in Georgia invested in a Georgia-based HBCU from 2001-2010.

Comparing the percentages in columns 2 and 5 allow us to assess the extent to which insurance companies exhibit home bias. As with retail investors, corporations can reap tax advantages from investing in same-state bonds, although as a general rule, the benefits are larger for individual investors. If positions were allocated in proportion to their total supply, we would expect for Georgia's insurance companies to invest 2.38% of its funds in Georgia-based HBCUs, and 0.36% in Georgia-based HBCUs. Instead, what we observe is extreme home bias for non-HBCUs – actual holdings are over an order of magnitude larger (27.06% versus 2.38%) than proportional allocation would prescribe – and inverse home bias for HBCUs, with 0% actually invested versus a prediction of 0.36%.

Simply perusing the table suggests that the findings for Georgia generalize. For non-HBCUs, the median (average) ratio of the percentages in column 5 (the fraction of state-level portfolios invested in same-state non-HBCUs) to column 2 (the percentage predicted with proportional allocation) is 3.43 (58.17), indicating substantial home bias by insurance companies in their fixed income holdings. However, of the ten states with HBCU-issued bonds in the insurance holdings sample, only half are owned by *any* insurance company in the issuing state. Put differently, among all insurers domiciled in Alabama, Arkansas, Georgia, Louisiana, and Virginia – states that collectively invested 34.5 times as much in same-state bonds relative to a proportional allocation – not a single one invested in a HBCU originating from the same state. Of the remaining five states that did invest in HBCUs, two (Mississippi and Tennessee) exhibit less home bias versus non-HBCUs. With the caveat that North Carolina-based HBCUs contribute 0.01% to the total dollar volume of college-issued bonds, and there appear to be almost no insurance companies domiciled in Washington D.C., these two areas, along with the state of Texas, show some slight favoritism for local HBCUs, relative to non-HBCUs.

Together, the evidence in Table 8 suggests that although insurance companies seem to have a strong preference for issuers in the same state, this is not true for HBCUs. The apparent lack of interest from local institutions – to the extent that this can be generalized from the portfolios of insurers – means that HBCU-issued bonds must either be sold to retail investors, which may be difficult to find in states where HBCUs are located, or to institutional clients out of state, which may find these bonds less attractive for tax reasons.

Note also the consistency with Table 5, which found that among Alabama, Louisiana, and Mississippi – states with the highest levels of anti-Black racial animus – gross spreads for HBCUs were much higher compared to other states. In these three states (along with Georgia, with ranks fourth-highest in racial animus), HBCUs are almost entirely excluded from insurance company portfolios, perhaps helping explain why underwriters and/or dealers face particular difficulty finding willing investors for these bonds.

## 5.4 Policy recommendations

What interventions are available that reduce, if not eliminate, the additional burden HBCUs face when attempting to access capital markets? Given that the pool of municipal bond investors is limited by both wealth and geography, policies that relax either constraint should, presumably, make it easier to find willing buyers, thereby reducing transactions costs in both the primary and secondary market.

One possibility is attempting to expand the set of potential investors through securitization. Much like Real Estate Investment Trusts (REITs) permit retail investors to take small positions in large, indivisible assets, instruments that allow investors to take small positions in municipal bonds would remove at least one barrier to participation. To some degree, such instruments already exist in the form of municipal bond mutual funds. However, if smaller trade sizes were attractive to less wealthy investors, the tax benefits are smaller.

A perhaps more promising alternative would involve eliminating the incentive of investors to hold bonds of local issuers. Assuming home-bias is not sufficiently binding, perhaps states could allow interest from out-of-state issuers to be tax exempt; eliminating state-level exemptions altogether would have the same effect. This would allow HBCUs to target investors in, say, New York or California, who could purchase HBCU bonds and not forgo the tax benefit that otherwise only accrues to purchasing home-state university bonds. With a larger pool of potential investors, gross spreads for HBCUs would, presumably, be reduced.

Of course, it is possible that to some degree, investors from low or zero tax states already compete with local investors, but for HBCUs, their effect is likely small. First, of the nine states with zero or near zero state income tax, over half (Alaska, Nevada, South Dakota, Wyoming, and New Hampshire) are very small. Second, and somewhat ironically from the perspective of HBCUs, three of the remaining four (Florida, Texas, and Tennessee) rank in the top ten of the dubious list presented in Table 6. Only Washington has both a low tax rate, and ranks low in anti-Black racial animus.

However promising, note that this potential solution faces a coordination problem, as described by Ang and Green (2011). The decision to honor, or not honor, state-level exemptions on municipal bonds from out-of-state issuers rests in the hands of local (state) government. And, although such a coordinated effort by multiple states would ease selling frictions for HBCUs (or other issuers facing geographically-related frictions), this is not necessarily individually rational for each state. Perhaps the special role of HBCUs in educating a particularly disadvantaged demographic would warrant Federal intervention.

If curbing racial animus in bond markets ultimately rests in the hands of politicians, history does not suggest a solution is imminent. Political action to pass legislation providing aid to HBCUs, such as the Morrill Act in 1862, was an encouraging step. However, roughly 100 years later, the Higher Education Act of 1965 acknowledged that the government itself implemented the legislation in a discriminatory fashion. Despite more explicit government support of HBCUs in more recent times, such as the White House Initiative on HBCUs, they continue to face a number of challenges. In 2011 for example, the Department of Education tightened credit standards for loans under Parental Loans for Undergraduate Students (PLUS) program. As shown by Johnson et al. (2015), though presumably enacted to lower credit risk and improve the health in the higher education system, the PLUS loan program has now been acknowledged to have particularly negative externalities on HBCUs.

HBCUs undoubtedly continue to face many challenges. Our work here suggests additional race-based challenges exist in a place where, on the surface, one would not expect such challenges. Fixing this problem will likely be difficult, but solutions must first begin with identification of a problem.

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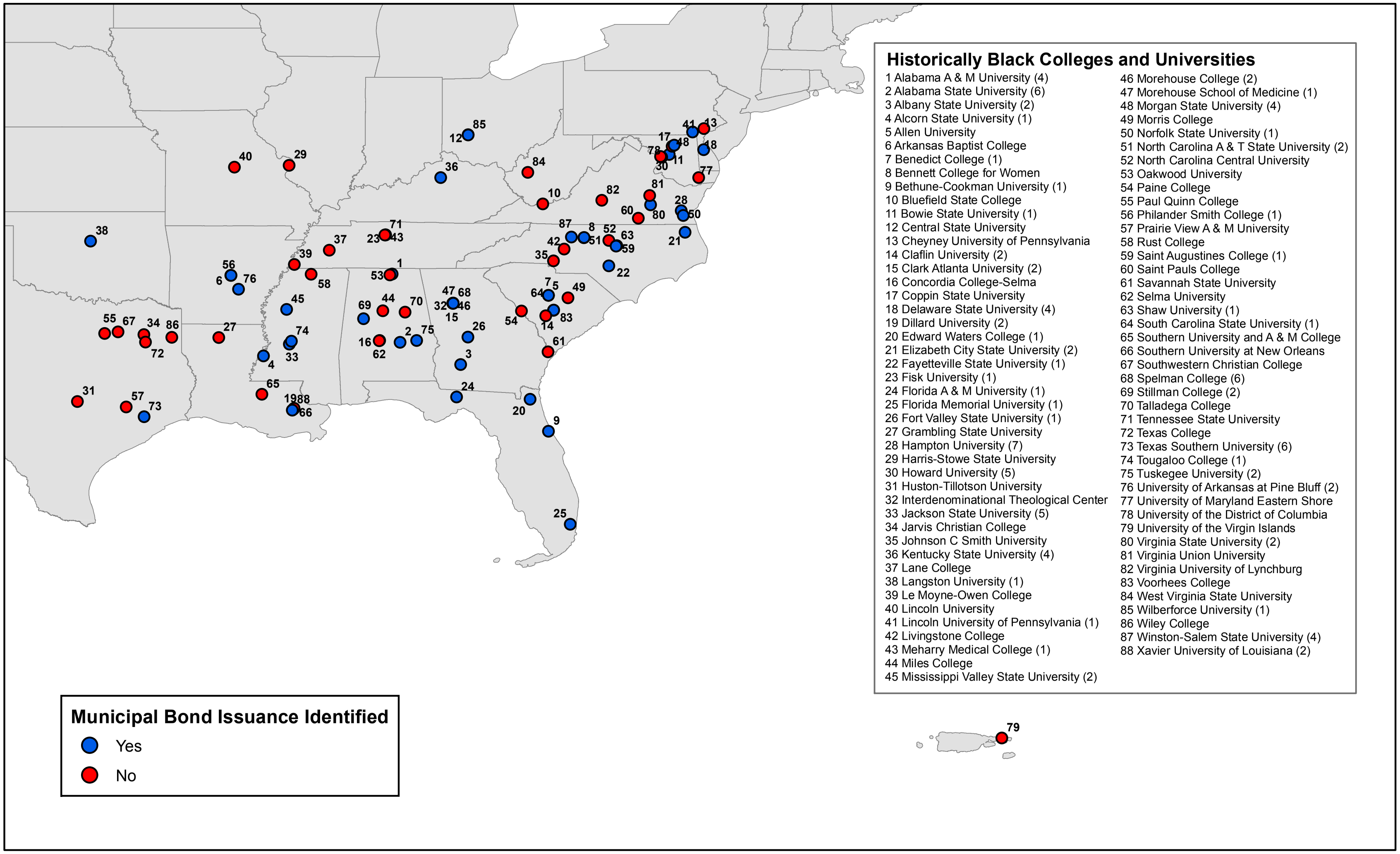



**Figure 1. Four Year Historically Black Colleges and Universities 1988 – 2010 per Delta Cost Project Database.** This figure plots the locations of all 4-year HBCUs in the Delta Cost Project Database over the 1988 – 2010 time period. Schools for which we can identify at least 1 municipal bond issuance in the SDC database over this same time period are marked with a red dot, while those with no identifiable bond issuances are marked with a blue dot. Additionally, school names are identified by number with the total number of issuances for each school indicated in parentheses.

**Figure 2. Official Statement Excerpts – Fort Valley State University, June 2006.** This figure shows excerpts from Fort Valley State University's 2006 Municipal Bond Issuance Official Statement. Notable portions from the excerpts are outlined in red.

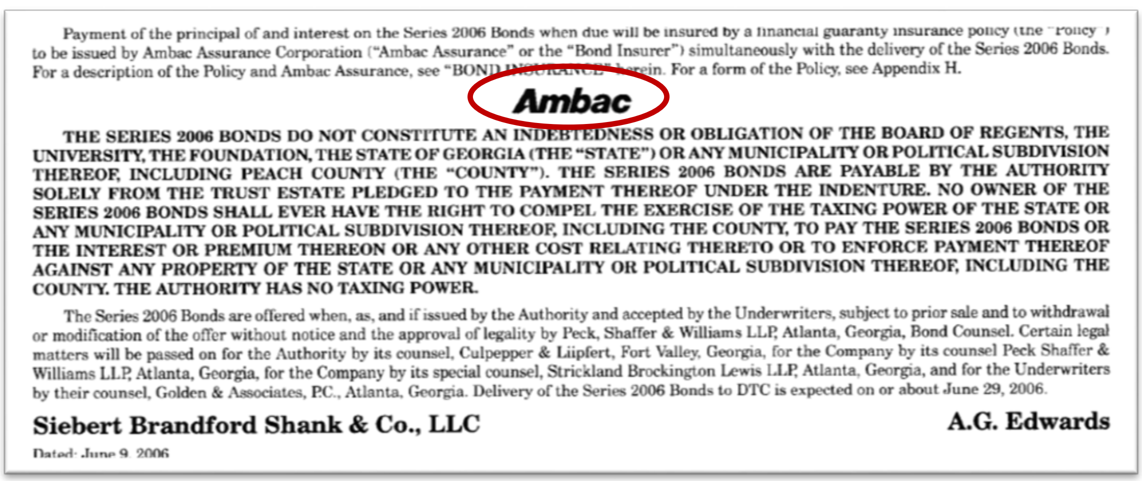
Official Statement Page 1:

NEW ISSUE –BOOK ENTRY ONLY

RATINGS:
*Moody's: "Aaa"*
*S&P: "AAA"*
(Ambac Insured)
(See "MISCELLANEOUS — Ratings" herein)

*In the opinion of Bond Counsel, under existing law, (i) interest on the hereinafter defined Series 2006 Bonds(including any original issue discount properly allocable to an owner thereof) will be excludable from gross income of the holders thereof for purposes of federal income taxation, (ii) interest on the Series 2006 Bonds will not be a specific item of tax preference for purposes of the federal alternative minimum tax imposed on individuals and corporations, and (iii) interest on the Series 2006 Bonds will be exempt from present income taxes under the laws of the State of Georgia, all subject to the qualifications described herein under the heading "TAX EXEMPTION.*

**$44,060,000**
**DEVELOPMENT AUTHORITY OF PEACH COUNTY**
**STUDENT HOUSING FACILITIES REVENUE BONDS**
**(FORT VALLEY STATE UNIVERSITY FOUNDATION PROPERTY, LLC PROJECT)**
**SERIES 2006**



Payment of the principal of and interest on the Series 2006 Bonds when due will be insured by a financial guaranty insurance policy (the "Policy") to be issued by Ambac Assurance Corporation ("Ambac Assurance" or the "Bond Insurer") simultaneously with the delivery of the Series 2006 Bonds. For a description of the Policy and Ambac Assurance, see "BOND INSURANCE" herein. For a form of the Policy, see Appendix H.

**Ambac**

**THE SERIES 2006 BONDS DO NOT CONSTITUTE AN INDEBTEDNESS OR OBLIGATION OF THE BOARD OF REGENTS, THE UNIVERSITY, THE FOUNDATION, THE STATE OF GEORGIA (THE "STATE") OR ANY MUNICIPALITY OR POLITICAL SUBDIVISION THEREOF, INCLUDING PEACH COUNTY (THE "COUNTY"). THE SERIES 2006 BONDS ARE PAYABLE BY THE AUTHORITY SOLELY FROM THE TRUST ESTATE PLEDGED TO THE PAYMENT THEREOF UNDER THE INDENTURE. NO OWNER OF THE SERIES 2006 BONDS SHALL EVER HAVE THE RIGHT TO COMPEL THE EXERCISE OF THE TAXING POWER OF THE STATE OR ANY MUNICIPALITY OR POLITICAL SUBDIVISION THEREOF, INCLUDING THE COUNTY, TO PAY THE SERIES 2006 BONDS OR THE INTEREST OR PREMIUM THEREON OR ANY OTHER COST RELATING THERETO OR TO ENFORCE PAYMENT THEREOF AGAINST ANY PROPERTY OF THE STATE OR ANY MUNICIPALITY OR POLITICAL SUBDIVISION THEREOF, INCLUDING THE COUNTY. THE AUTHORITY HAS NO TAXING POWER.**

The Series 2006 Bonds are offered when, as, and if issued by the Authority and accepted by the Underwriters, subject to prior sale and to withdrawal or modification of the offer without notice and the approval of legality by Peck, Shaffer & Williams LLP, Atlanta, Georgia, Bond Counsel. Certain legal matters will be passed on for the Authority by its counsel, Culpepper & Liipfert, Fort Valley, Georgia, for the Company by its counsel Peck Shaffer & Williams LLP, Atlanta, Georgia, for the Company by its special counsel, Strickland Brockington Lewis LLP, Atlanta, Georgia, and for the Underwriters by their counsel, Golden & Associates, P.C., Atlanta, Georgia. Delivery of the Series 2006 Bonds to DTC is expected on or about June 29, 2006.

**Siebert Brandford Shank & Co., LLC** **A.G. Edwards**

Dated: June 9, 2006

**Figure 2. Official Statement Excerpts – Fort Valley State University, June 2006 (Continued).**

Official Statement Page 2:

MATURITIES, PRINCIPAL AMOUNTS, INTEREST RATES AND PRICES OR YIELDS

SERIES 2006 BONDS

$11,880,000 Serial Bonds

| June 1 of the Year | Principal Amount | Interest Rate | Yield | CUSIP |
|---|---|---|---|---|
| 2009 | $ 70,000 | 4.000% | 3.700% | 704646AA6 |
| 2010 | 130,000 | 4.000% | 3.720% | 704646AB4 |
| 2011 | 195,000 | 4.000% | 3.760% | 704646AC2 |
| 2012 | 260,000 | 4.000% | 3.840% | 704646AD0 |
| 2013 | 280,000 | 4.000% | 3.920% | 704646AE8 |
| 2014 | 305,000 | 4.000% | 4.000% | 704646AF5 |
| 2015 | 380,000 | 4.000% | 4.070% | 704646AG3 |
| 2016 | 460,000 | 4.000% | 4.140% | 704646AH1 |
| 2017 | 540,000 | 4.000% | 4.200% | 704646AJ7 |
| 2018 | 630,000 | 4.000% | 4.260% | 704646AK4 |
| 2019 | 725,000 | 4.125% | 4.310% | 704646AL2 |
| 2020 | 830,000 | 4.250% | 4.360% | 704646AM0 |
| 2021 | 935,000 | 4.250% | 4.410% | 704646AN8 |
| 2022 | 1,055,000 | 4.250% | 4.460% | 704646AP3 |
| 2023* | 1,115,000 | 5.000% | 4.330% | 704646AQ1 |
| 2024 | 1,190,000 | 4.375% | 4.540% | 704646AR9 |
| 2025 | 1,320,000 | 4.375% | 4.560% | 704646AS7 |
| 2026 | 1,460,000 | 4.375% | 4.580% | 704646AT5 |

$ 6,020,000* 5.000% Term Bonds, Due June 1, 2034, Priced to Yield 4.550% CUSIP 704646AU2

$26,160,000 4.500% Term Bonds, Due June 1, 2037, Priced to Yield 4.720% CUSIP 704646AV0

* Priced to June 1, 2016 optional redemption date.

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**Underwriting**

Under a Bond Purchase Agreement among Siebert Brandford Shank & Co., LLC, on behalf of itself and A.G. Edwards & Sons, Inc. (together, the "Underwriters"), the Authority and the Company (the "Bond Purchase Agreement"), the Series 2006 Bonds will be purchased by the Underwriters. The Bond Purchase Agreement provides that the Underwriters will purchase all of the Series 2006 Bonds, if any are purchased. The obligation of the Underwriters to accept delivery of the Series 2006 Bonds is subject to various conditions contained in the Bond Purchase Agreement. The Underwriters have agreed to purchase the Series 2006 Bonds at an aggregate purchase price of $42,933,342 (representing the par amount of the Series 2006 Bonds, less original issue discount of $840,263 less an Underwriters' discount of $286,395), subject to certain terms and conditions set forth in the Bond Purchase Agreement.

**Table 1. Bond Issue Summary Statistics.**

This table reports descriptive statistics for our sample of 4-year university municipal bond issues. Panel A reports the annual number and percentage of bond issues by HBCUs and non-HBCUs. Panel B reports summary statistics for our full sample. Statistics reported include the total number of observations (N), mean, standard deviation, median, minimum, and maximum. Statistics are reported for the following issue-level variables: the issue gross spread (Gross spread), the total amount of the issue (Amount), the longest maturity in the issue (Max Maturity), a dummy variable that equals 1 if the issue is callable (Callable), a dummy variable that equals 1 if the issue is insured (Insured), dummy variables signifying if the issue is rated AAA (AAA-rated), rated AA (AA-rated), rated below AA (Below AA), or unrated (Unrated), a dummy variable that equals 1 if the issue is sold to underwriters on a competitive (rather than a negotiated) basis (Competitive bid), a dummy variable that equals 1 if the issue has an attached sinking fund (Sinking fund), a dummy variable that equals 1 if the bonds being issued are revenue bonds (Revenue bond), a dummy variable that equals 1 if the issue is eventually refunded (Pre-refunded), the number of full-time equivalent students in attendance at the issue's associated school (Students), a dummy variable that equals 1 if the issuing school is public, annual alumni giving per student by the issuing school (Giving Per Student), and a dummy variable that equals 1 if the issue is by an historically black college or university (HBCU). Panel C reports summary statistics separately for HBCUs and non-HBCUs and tests to see if these variables are statistically different between these two groups. Statistical significance is indicated as follows: $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, and $^{***}$ $p < 0.01$.

Panel A: Bond Issues Per Year

| Year | (1) Non-HBCU | (2) HBCU | (3) Total |
|---|---|---|---|
| 1988 | 115 | 2 | 117 |
| | 2.84 | 1.96 | 2.82 |
| 1989 | 105 | 2 | 107 |
| | 2.60 | 1.96 | 2.58 |
| 1990 | 78 | 2 | 80 |
| | 1.93 | 1.96 | 1.93 |
| 1991 | 129 | 1 | 130 |
| | 3.19 | 0.98 | 3.14 |
| 1992 | 168 | 4 | 172 |
| | 4.16 | 3.92 | 4.15 |
| 1993 | 200 | 5 | 205 |
| | 4.95 | 4.90 | 4.95 |
| 1994 | 116 | 1 | 117 |
| | 2.87 | 0.98 | 2.82 |
| 1995 | 89 | 2 | 91 |
| | 2.20 | 1.96 | 2.20 |
| 1996 | 143 | 8 | 151 |

| | | | |
|---|---|---|---|
| | 3.54 | 7.84 | 3.64 |
| 1997 | 150 | 4 | 154 |
| | 3.71 | 3.92 | 3.72 |
| 1998 | 222 | 8 | 230 |
| | 5.49 | 7.84 | 5.55 |
| 1999 | 231 | 3 | 234 |
| | 5.71 | 2.94 | 5.65 |
| 2000 | 183 | 6 | 189 |
| | 4.53 | 5.88 | 4.56 |
| 2001 | 204 | 5 | 209 |
| | 5.05 | 4.90 | 5.04 |
| 2002 | 173 | 7 | 180 |
| | 4.28 | 6.86 | 4.34 |
| 2003 | 195 | 8 | 203 |
| | 4.82 | 7.84 | 4.90 |
| 2004 | 197 | 9 | 206 |
| | 4.87 | 8.82 | 4.97 |
| 2005 | 207 | 3 | 210 |
| | 5.12 | 2.94 | 5.07 |
| 2006 | 219 | 8 | 227 |
| | 5.42 | 7.84 | 5.48 |
| 2007 | 258 | 8 | 266 |
| | 6.38 | 7.84 | 6.42 |
| 2008 | 277 | 1 | 278 |
| | 6.85 | 0.98 | 6.71 |
| 2009 | 181 | 2 | 183 |
| | 4.48 | 1.96 | 4.41 |
| 2010 | 203 | 3 | 206 |
| | 5.02 | 2.94 | 4.97 |
| Total | 4,043 | 102 | 4,145 |
| | 100 | 100 | 100 |

**Table 1. Bond Issuance Summary Statistics (Continued).**

Panel B: Pooled Descriptive Statistics

| | (1) N | (2) Mean | (3) SD | (4) Median | (5) Min | (6) Max |
|---|---|---|---|---|---|---|
| Gross spread | 4145 | 80.87 | 46.58 | 69.96 | 10.71 | 225.00 |
| Amount (/1000000) | 4145 | 35.13 | 43.15 | 20.38 | 0.90 | 247.09 |
| Max Maturity | 4145 | 23.28 | 8.01 | 24.99 | 1.00 | 39.95 |
| Callable | 4145 | 0.90 | 0.31 | 1 | 0 | 1 |
| Insured | 4145 | 0.56 | 0.50 | 1 | 0 | 1 |
| AAA-rated | 4145 | 0.42 | 0.49 | 0 | 0 | 1 |
| AA-rated | 4145 | 0.17 | 0.38 | 0 | 0 | 1 |
| Below AA | 4145 | 0.14 | 0.35 | 0 | 0 | 1 |
| Unrated | 4145 | 0.27 | 0.44 | 0 | 0 | 1 |
| Competitive Bid | 4145 | 0.09 | 0.28 | 0 | 0 | 1 |
| Sinking Fund | 4145 | 0.61 | 0.49 | 1 | 0 | 1 |
| Revenue Bond | 4145 | 0.96 | 0.19 | 1 | 0 | 1 |
| Pre-refunded | 4145 | 0.19 | 0.39 | 0 | 0 | 1 |
| # of Underwriter Deals | 4145 | 22.18 | 24.66 | 14.00 | 0.00 | 104.00 |
| Students (/1000) | 4145 | 9.79 | 10.03 | 5.81 | 0.45 | 44.20 |
| Public | 4145 | 0.40 | 0.49 | 0 | 0 | 1 |
| Giving Per Student (/1000) | 2745 | 4.97 | 5.89 | 2.65 | 0.11 | 30.46 |
| HBCU | 4145 | 0.02 | 0.15 | 0 | 0 | 1 |

**Table 1. Bond Issuance Summary Statistics (Continued).**

Panel C: HBCU and Non-HBCU Variable Comparison

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | Non-HBCU | | | HBCU | | | |
| | N | Mean | SD | N | Mean | SD | Diff |
| Gross Spread (bps) | 4043 | 80.59 | 46.59 | 102 | 92.06 | 45.05 | 11.47*** |
| Amount (/1000000) | 4043 | 35.38 | 43.55 | 102 | 25.24 | 19.30 | −10.14*** |
| Max Maturity | 4043 | 23.26 | 8.05 | 102 | 24.03 | 6.25 | 0.77 |
| Callable | 4043 | 0.90 | 0.31 | 102 | 0.91 | 0.29 | 0.01 |
| Insured | 4043 | 0.55 | 0.50 | 102 | 0.80 | 0.40 | 0.25*** |
| AAA-rated | 4043 | 0.41 | 0.49 | 102 | 0.54 | 0.50 | 0.13** |
| AA-rated | 4043 | 0.17 | 0.38 | 102 | 0.15 | 0.36 | −0.02 |
| Below AA | 4043 | 0.14 | 0.35 | 102 | 0.02 | 0.14 | 0.12*** |
| Unrated | 4043 | 0.27 | 0.44 | 102 | 0.29 | 0.46 | 0.02 |
| Competitive Bid | 4043 | 0.09 | 0.28 | 102 | 0.08 | 0.27 | −0.01 |
| Sinking Fund | 4043 | 0.61 | 0.49 | 102 | 0.64 | 0.48 | 0.03 |
| Revenue Bond | 4043 | 0.96 | 0.19 | 102 | 1.00 | 0.00 | 0.04 |
| Pre-refunded | 4043 | 0.19 | 0.39 | 102 | 0.17 | 0.37 | −0.02 |
| Underwriter Deals | 4043 | 22.37 | 24.72 | 102 | 14.61 | 20.76 | −7.76*** |
| Students (/1000) | 4043 | 9.94 | 10.11 | 102 | 3.97 | 2.45 | −5.97*** |
| Public | 4043 | 0.40 | 0.49 | 102 | 0.57 | 0.50 | 0.17 |
| Giving Per Student (/1000) | 2683 | 5.04 | 5.92 | 62 | 1.91 | 3.38 | −3.13*** |

**Table 2. Determinants of Gross Spread.**

This table reports estimates for the following regression specification:

$$Gross\ Spread = \alpha_0 + \alpha_1 HBCU + \beta Controls + \varepsilon$$

where controls include issue, underwriter, and school characteristics as outlined in Table 1 and issuance rating, issuance insurer, and issuer state-year fixed effects. Each regression observation represents one municipal bond issuance. Column 6 restricts the sample to only AAA-rated issuances. Column 7 and 8 restrict the sample to only insured issuances. Regression standard errors are in parentheses and are robust to heteroscedasticity and clustered by school-date. Statistical significance is indicated as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Sample: | All | All | All | All | All | AAA Only | Insured Only | Insured Only |
| | Gross Spread | Gross Spread | Gross Spread | Gross Spread | Gross Spread | Gross Spread | Gross Spread | Gross Spread |
| HBCU | 11.47** | 21.33*** | 18.55*** | 17.83*** | 16.02*** | 14.68** | 16.87*** | 15.73*** |
| | (4.83) | (5.09) | (4.69) | (4.71) | (4.65) | (7.27) | (5.20) | (5.40) |
| Log(Amount) | | | -11.88*** | -11.67*** | -9.93*** | -6.04*** | -6.85*** | -6.47*** |
| | | | (0.71) | (0.71) | (0.79) | (1.41) | (1.17) | (1.26) |
| Log(Maturity) | | | 13.61*** | 13.37*** | 13.11*** | 2.22 | 4.55 | 5.44* |
| | | | (1.48) | (1.48) | (1.48) | (3.54) | (2.98) | (3.05) |
| Callable | | | 5.87** | 5.90** | 5.82** | 3.95 | 3.79 | 3.76 |
| | | | (2.32) | (2.32) | (2.34) | (3.70) | (3.45) | (3.58) |
| Insured | | | -9.20*** | -9.33*** | -12.88*** | 11.30*** | | |
| | | | (1.84) | (1.84) | (1.87) | (3.81) | | |
| Competitive Bid | | | 3.32 | 3.12 | 2.35 | -2.18 | -0.84 | -1.47 |
| | | | (3.07) | (3.06) | (3.10) | (5.14) | (4.70) | (4.58) |
| Sinking Fund | | | 11.83*** | 12.09*** | 10.90*** | 3.52 | 2.38 | 1.28 |
| | | | (1.53) | (1.54) | (1.52) | (2.48) | (2.11) | (2.18) |
| Revenue Bond | | | 19.33*** | 19.65*** | 22.20*** | 8.68 | 15.04* | 9.56 |
| | | | (4.07) | (4.06) | (4.09) | (13.04) | (8.90) | (8.99) |
| Pre-refunded | | | 2.34 | 2.48 | 2.50 | 3.21 | 0.85 | 0.48 |
| | | | (1.70) | (1.69) | (1.67) | (2.51) | (2.27) | (2.33) |
| Log(# of Underwriter Deals) | | | | -1.77*** | -1.56*** | -1.45 | -0.90 | -1.76** |
| | | | | (0.59) | (0.59) | (0.89) | (0.72) | (0.77) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Log(Students) | | | | | -2.21** | -2.50* | -1.15 | -1.45 |
| | | | | | (0.86) | (1.40) | (1.32) | (1.42) |
| Public | | | | | 8.35*** | 10.92*** | 9.33*** | 10.05*** |
| | | | | | (2.15) | (3.82) | (3.12) | (3.21) |
| Giving Rate Tercile (L) | | | | | -2.38 | 0.15 | -1.31 | -1.35 |
| | | | | | (2.02) | (2.96) | (2.39) | (2.49) |
| Giving Rate Tercile (M) | | | | | -6.40*** | -3.04 | -3.17 | -3.47 |
| | | | | | (1.98) | (3.31) | (2.62) | (2.71) |
| Giving Rate Tercile (H) | | | | | -9.61*** | 1.59 | -0.89 | 0.07 |
| | | | | | (1.98) | (3.35) | (2.61) | (2.85) |
| Constant | 80.59*** | 80.35*** | 47.19*** | 51.09*** | 67.33*** | 81.95*** | 131.23*** | 146.70*** |
| | (0.77) | (0.58) | (4.53) | (4.73) | (7.92) | (18.82) | (16.11) | (16.89) |
| Rating FE? | No | No | Yes | Yes | Yes | No | Yes | Yes |
| Insurer FE? | No | No | No | No | No | No | Yes | Yes |
| State-YR FE? | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4145 | 4145 | 4145 | 4145 | 4145 | 1729 | 2314 | 2076 |
| $R^2$ | 0.001 | 0.542 | 0.639 | 0.640 | 0.646 | 0.716 | 0.731 | 0.729 |

**Table 3. Matching Estimator for HBCU Treatment Effects.**
Panel A of this table reports estimates of bias-adjusted average treatment effects on the treated for a matched sample of HBCU (treated) and non-HBCU (untreated) bond issue gross spreads (see Abadie and Imbens (2011)). Panel B reports the covariate means, standardized differences, and variance ratios for variables corresponding to our matched sample. Issues are matched using a nearest neighbor matching estimator (see Abadie and Imbens 2006) which matches issues on covariates that differed between HBCUs and non-HBCUs in Panel C of Table 1. Exact matches were required on state and credit rating. Individual schools backing the issuances analyzed here are listed in Appendix A2.

Panel A: Bias Adjusted Treatment Effects on the Treated (ATET)

| (1) ATET | (2) S.E. | (3) *p*-value | (4) 95% Conf. Interval |
|---|---|---|---|
| 20.66 | 7.94 | 0.009 | [5.09,36.23] |

Panel B: Covariate Balance Diagnostics

| | (1) HBCU Mean | (2) Non-HBCU Mean | (3) Standardized Difference | (4) Variance Ratio |
|---|---|---|---|---|
| Log(Amount) | 2.99 | 3.10 | -0.14 | 1.27 |
| Log(# of Underwriter Deals) | 1.69 | 1.78 | -0.06 | 1.11 |
| Insured | 0.87 | 0.87 | 0.00 | 1.00 |
| Log(Students) | 8.17 | 8.28 | -0.14 | 0.43 |
| Year | 1999.90 | 2000.28 | -0.07 | 0.99 |
| Giving Rate Tercile (L) | 0.14 | 0.10 | 0.13 | 1.36 |
| Giving Rate Tercile (M) | 0.04 | 0.03 | 0.08 | 1.48 |
| Giving Rate Tercile (H) | 0.48 | 0.45 | 0.06 | 1.01 |

**Table 4. Ranking of Racial Animus by State.**

This table reports rankings (1 to 51 with ties receiving their average rank) by different measures of racial animus across states (excluding Alaska for lack of data, but including Washington D.C.). In all instances a higher ranking (lower number) indicates greater racial animus. Columns 2 and 3 derive their rankings from the Cooperative Congressional Election Study (CCES, Ansolabehere (2012)). The CCES is a 50,000+ person national stratified sample survey administered by YouGov/Polimetrix. Column 2 ranks states by their level of racial resentment while column 3 ranks states by their opposition to affirmative action. Column 4 ranks states by racially charged Google searches following Stephens-Davidowitz (2014), and column 5 ranks states by their level of racist Tweets following Barack Obama's re-election in 2012 (Zook 2012). Column 6 reports the sum across all ranks for each state. States ranking in the top 10 on all of the four racial animus metrics are designated as "high racial animus" states and their corresponding rows are highlighted in gray. Columns 7 and 8 report the number of bonds per state issued by all schools and all HBCUs residing in that state.

| (1) State | (2) Opposition to Affirmative Action (CCES) | (3) Racial Resentment (CCES) | (4) Racially Charged Google Searches (Stephens-Davidowitz 2014) | (5) Racially Charged Geocoded Tweets (Zook 2012) | (6) Sum of 4 Ranks | (7) # of Bond Issues in Total | (8) # of Bond Issues by HBCUs |
|---|---|---|---|---|---|---|---|
| LA | 1 | 1 | 2 | 6 | 10 | 57 | 4 |
| MS | 2 | 3 | 4 | 2 | 11 | 46 | 9 |
| AL | 4 | 2 | 8.5 | 1 | 15.5 | 92 | 14 |
| GA | 3 | 4 | 16.5 | 3 | 26.5 | 99 | 14 |
| TN | 11 | 6 | 11 | 7 | 35 | 59 | 2 |
| AR | 6 | 7 | 14.5 | 13.5 | 41 | 107 | 2 |
| SC | 7 | 5 | 8.5 | 23.5 | 44 | 52 | 4 |
| WV | 33 | 10 | 1 | 9 | 53 | 17 | 0 |
| FL | 10 | 14 | 12.5 | 26 | 62.5 | 126 | 4 |
| KY | 27 | 20 | 5 | 13.5 | 65.5 | 83 | 4 |
| OH | 20 | 16 | 6.5 | 23.5 | 66 | 204 | 1 |
| NC | 17 | 13 | 16.5 | 20 | 66.5 | 136 | 11 |
| TX | 5 | 8 | 27.5 | 26 | 66.5 | 121 | 6 |
| MO | 18 | 25 | 18.5 | 8 | 69.5 | 166 | 1 |
| PA | 19 | 23 | 3 | 32 | 77 | 334 | 1 |
| MI | 14 | 26 | 6.5 | 33 | 79.5 | 127 | 0 |
| NV | 12 | 12 | 20 | 36.5 | 80.5 | 2 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OK | 9 | 15 | 22 | 36.5 | 82.5 | 60 | 1 |
| ND | 32 | 18 | 34.5 | 4.5 | 89 | 27 | 0 |
| VA | 21 | 24 | 29.5 | 20 | 94.5 | 77 | 10 |
| KS | 31 | 29 | 27.5 | 11 | 98.5 | 76 | 0 |
| MD | 30 | 28 | 24 | 16.5 | 98.5 | 40 | 5 |
| NJ | 24 | 30 | 10 | 36.5 | 100.5 | 136 | 0 |
| IL | 28 | 34 | 22 | 20 | 104 | 151 | 0 |
| NE | 26 | 19 | 33 | 28 | 106 | 64 | 0 |
| UT | 22 | 33 | 51 | 4.5 | 110.5 | 40 | 0 |
| AZ | 13 | 17 | 38 | 43 | 111 | 79 | 0 |
| IN | 23 | 21 | 25.5 | 41.5 | 111 | 157 | 0 |
| ID | 8 | 9 | 48 | 47.5 | 112.5 | 28 | 0 |
| DE | 38 | 27 | 22 | 26 | 113 | 9 | 4 |
| WI | 37 | 37 | 25.5 | 13.5 | 113 | 33 | 0 |
| SD | 25 | 11 | 40 | 47.5 | 123.5 | 6 | 0 |
| AK | 15 | 22 | 40 | 47.5 | 124.5 | 0 | 0 |
| CO | 29 | 35 | 48 | 13.5 | 125.5 | 57 | 0 |
| CT | 42 | 39 | 18.5 | 36.5 | 136 | 81 | 0 |
| NY | 41 | 41 | 12.5 | 41.5 | 136 | 283 | 0 |
| WY | 16 | 32 | 42.5 | 47.5 | 138 | 8 | 0 |
| NH | 35 | 38 | 34.5 | 31 | 138.5 | 32 | 0 |
| IA | 34 | 31 | 36 | 40 | 141 | 111 | 0 |
| MN | 45 | 43 | 45 | 10 | 143 | 64 | 0 |
| RI | 40 | 44 | 14.5 | 47.5 | 146 | 57 | 0 |
| NM | 43 | 40 | 48 | 16.5 | 147.5 | 20 | 0 |
| CA | 39 | 42 | 31 | 36.5 | 148.5 | 204 | 0 |
| ME | 46 | 46 | 32 | 30 | 154 | 9 | 0 |
| OR | 47 | 47 | 44 | 20 | 158 | 33 | 0 |
| WA | 44 | 45 | 40 | 29 | 158 | 72 | 0 |
| MT | 36 | 36 | 42.5 | 47.5 | 162 | 15 | 0 |
| DC | 51 | 51 | 46 | 20 | 168 | 30 | 5 |
| MA | 48 | 49 | 37 | 36.5 | 170.5 | 223 | 0 |
| VT | 50 | 50 | 29.5 | 47.5 | 177 | 32 | 0 |
| HI | 49 | 48 | 50 | 47.5 | 194.5 | 3 | 0 |

**Table 5. High/Low Racial Animus By State And The HBCU Effect.**
Panel A of this table reports the number of observations and average Gross Spread for HBCU and non-HBCU bond issues issued from schools located in high racial animus and low racial animus states. Also reported is the difference between HBCU and non-HBCU average gross spreads within high and low racial animus states and these differences corresponding $p$-values. Panel B reports these same difference-in-differences in a multivariate regression setting using the same model as reported in Table 2.

Panel A: Average Gross Spread by HBCU Status and Racial Animus Level of State

| | (1) High Animus | (2) Low Animus |
|---|---|---|
| Non-HBCU | 82.93 | 80.49 |
| | 168 | 3875 |
| HBCU | 105.86 | 87.09 |
| | 27 | 75 |
| HBCU − Non-HBCU | 22.92 | 6.61 |
| $p$-value | 0.01 | 0.23 |

**Table 5. High/Low Racial Animus By State And The HBCU Effect (Continued).**

Panel B: Multivariate Test of Difference-in-Differences

| | (1)<br>Gross<br>Spread | (2)<br>Gross<br>Spread |
|---|---|---|
| HBCU | 10.80** | 30.43** |
| | (4.86) | (11.76) |
| Log(Amount) | -9.55*** | -15.82*** |
| | (0.80) | (4.25) |
| Log(Maturity) | 13.01*** | 9.61 |
| | (1.50) | (8.65) |
| Callable | 6.49*** | -6.69 |
| | (2.39) | (10.40) |
| Insured | -12.85*** | -12.06 |
| | (1.90) | (10.18) |
| Competitive Bid | 2.15 | 1.83 |
| | (3.21) | (13.52) |
| Sinking Fund | 10.91*** | 11.79* |
| | (1.56) | (6.67) |
| Revenue Bond | 21.78*** | |
| | (4.08) | |
| Pre-refunded | 1.86 | 18.87* |
| | (1.68) | (11.31) |
| Log(# of Underwriter Deals) | -1.89*** | 3.68 |
| | (0.61) | (2.82) |
| Log(Students) | -2.16** | -8.06 |
| | (0.87) | (7.99) |
| Public | 8.01*** | 31.06** |
| | (2.18) | (15.52) |
| Giving Rate Tercile (L) | -2.46 | 0.96 |
| | (2.06) | (10.32) |
| Giving Rate Tercile (M) | -5.81*** | -10.59 |

| | | |
|---|---|---|
| | (2.02) | (11.08) |
| Giving Rate Tercile (H) | -9.59*** | 11.84 |
| | (1.98) | (19.60) |
| Constant | 67.10*** | 140.59** |
| | (7.98) | (60.09) |
| Rating FE? | Yes | Yes |
| State-YR FE? | Yes | Yes |
| Observations | 3950 | 195 |
| $R^2$ | 0.649 | 0.680 |

**Table 6. Analysis of Newly Issued Bonds.**

Panel A of this table reports descriptive statistics for the variables used to estimate the regressions reported in Panel B. Panel B reports trade-level regression estimates of bond markups, reoffering prices, and sale prices on an HBCU dummy variable and other trade price determinants. All regression samples are restricted to a time period within 10 days of the offering date. Heteroscedasticity-consistent standard errors are double clustered on deal and day of trade and are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Panel A: Summary Statistics

| | (1)<br>N | (2)<br>Mean | (3)<br>SD | (4)<br>Median | (5)<br>Min | (6)<br>Max |
|---|---|---|---|---|---|---|
| Trade-level | | | | | | |
| Markup (bps) | 108646 | 129.94 | 147.76 | 116.85 | -1034.66 | 1652.12 |
| Offering Price | 108646 | 99.81 | 3.45 | 98.84 | 83.61 | 119.35 |
| Sale Price | 108646 | 101.08 | 2.89 | 100.00 | 83.61 | 119.10 |
| Days Since Offering | 108646 | 3.09 | 3.10 | 2.00 | -25.00 | 10.00 |
| Trade Size (/1000) | 108646 | 280.22 | 1044.99 | 30.00 | 5.00 | 10850.00 |
| Bond-level | | | | | | |
| Bond Amount (/1000000) | 108646 | 7.80 | 9.26 | 3.48 | 0.05 | 29.97 |
| Bond Maturity | 108646 | 16.87 | 8.68 | 16.50 | 1.00 | 30.50 |
| Issue-level | | | | | | |
| Callable | 108646 | 0.98 | 0.13 | 1 | 0 | 1 |
| Insured | 108646 | 0.45 | 0.50 | 0 | 0 | 1 |
| AAA-rated | 108646 | 0.38 | 0.49 | 0 | 0 | 1 |
| AA-rated | 108646 | 0.26 | 0.44 | 0 | 0 | 1 |
| Below AA | 108646 | 0.18 | 0.39 | 0 | 0 | 1 |
| Unrated | 108646 | 0.17 | 0.38 | 0 | 0 | 1 |
| Competitive Bid | 108646 | 0.08 | 0.26 | 0 | 0 | 1 |
| Sinking Fund | 108646 | 0.81 | 0.40 | 1 | 0 | 1 |
| Revenue Bond | 108646 | 0.97 | 0.17 | 1 | 0 | 1 |
| Pre-refunded | 108646 | 0.02 | 0.14 | 0 | 0 | 1 |
| # of Underwriter Deals | 108646 | 36.62 | 29.35 | 29.00 | 0.00 | 104.00 |
| Students (/1000) | 108646 | 11.71 | 10.31 | 8.64 | 0.45 | 44.20 |
| Public | 108646 | 0.53 | 0.50 | 1 | 0 | 1 |
| Giving Per Student (/1000) | 78885 | 5.00 | 6.97 | 2.25 | 0.11 | 30.46 |
| HBCU | 108646 | 0.02 | 0.13 | 0 | 0 | 1 |

**Table 6. Analysis of Newly Issued Bonds (Continued).**

Panel B: Determinants Of Markup, Offering Price, and Sale Price

| | (1) Markup | (2) Offering Price | (3) Sale Price |
|---|---|---|---|
| HBCU | 1.74 | 0.10 | 0.13 |
| | (27.11) | (0.67) | (0.65) |
| Days Since Offering | 9.25*** | -0.10*** | -0.01 |
| | (1.03) | (0.02) | (0.01) |
| Log(Trade Size) | -31.38*** | 0.66*** | 0.35*** |
| | (2.01) | (0.03) | (0.03) |
| Log(Bond Amount) | 11.99*** | 0.02 | 0.13 |
| | (4.62) | (0.09) | (0.08) |
| Log(Bond Maturity) | 52.40*** | -1.40*** | -0.90*** |
| | (5.15) | (0.13) | (0.12) |
| Callable | 29.51 | -2.41** | -2.09** |
| | (33.04) | (0.99) | (0.84) |
| Insured | 4.37 | -0.71 | -0.66* |
| | (26.29) | (0.44) | (0.40) |
| Competitive Bid | -54.29 | -0.23 | -0.76 |
| | (49.41) | (0.64) | (0.57) |
| Sinking Fund | -8.62 | -0.29 | -0.38 |
| | (15.52) | (0.37) | (0.31) |
| Revenue Bond | -7.00 | -0.70 | -0.78 |
| | (45.01) | (1.17) | (1.20) |
| Pre-refunded | 58.29 | -0.48 | 0.09 |
| | (47.00) | (0.72) | (0.55) |
| Log(# of Underwriter Deals) | 3.00 | 0.04 | 0.07 |
| | (5.87) | (0.11) | (0.09) |
| Log(Students) | -8.22 | 0.21 | 0.14 |
| | (13.27) | (0.24) | (0.21) |
| Public | 10.77 | -0.26 | -0.16 |
| | (27.04) | (0.53) | (0.48) |

| | | | |
|---|---|---|---|
| Giving Rate Tercile (L) | 2.68 | 0.03 | 0.06 |
| | (26.23) | (0.34) | (0.31) |
| Giving Rate Tercile (M) | 5.44 | 0.20 | 0.26 |
| | (22.89) | (0.44) | (0.42) |
| Giving Rate Tercile (H) | -14.07 | 0.25 | 0.11 |
| | (28.52) | (0.45) | (0.44) |
| Constant | 317.96** | 99.24*** | 102.32*** |
| | (149.89) | (2.72) | (2.64) |
| Rating FE? | Yes | Yes | Yes |
| State-YR FE? | Yes | Yes | Yes |
| Observations | 108646 | 108646 | 108646 |
| $R^2$ | 0.536 | 0.443 | 0.299 |

**Table 7. Analysis Of Seasoned Trades.**

Panel A of this table reports summary statistics for the variables used to estimate secondary market trading costs in Panel B. Panel B reports regression estimates for the following equation:

$$\Delta P = \beta_0 + \beta_1 \Delta Tradesign + \beta_2 \Delta Tradesign \times HBCU + \beta_3 HBCU + \Gamma Controls + \varepsilon$$

where ΔPrice is the percentage change in a bond's trade price, ΔTradesign is the change in Tradesign which is an indicator variable that equals one for dealer sells and negative one for dealer purchases, and HBCU and Controls are as previously defined. Each regression observation corresponds to a bond trade. All regression samples are restricted to seasoned bond trades, i.e., only trades occurring at least 60 days after a bond's offering date. Columns 4 – 6 are further restricted by trade size. Column 4 limits the sample to trades less than \$25,000, column 5 to trades between \$25,000 and \$100,000, and column 6 to trades greater than \$100,000. Panel C reports regressions of bond purchase and sale yields and the number of days for a bond to make a round trip trade (Days To Sell), i.e., a trade consisting of a dealer purchase immediately followed by dealer sales that add to the same amount as the initial purchase amount. Heteroscedasticity-consistent standard errors are double clustered on deal and day of trade and are reported in parentheses. $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, and $^{***}$ $p < 0.01$.

Panel A: Summary Statistics

| | (1) N | (2) Mean | (3) SD | (4) Median | (5) Min | (6) Max |
|---|---|---|---|---|---|---|
| Trade-level | | | | | | |
| ΔPrice (in %) | 317566 | -0.17 | 2.06 | 0.00 | -5.76 | 4.50 |
| ΔTradesign | 317566 | -0.18 | 1.45 | 0 | -2 | 2 |
| Trade Size (/1000000) | 317566 | 136.79 | 715.38 | 25.00 | 5.00 | 10850.00 |
| Purchase Yield (in %) | 113426 | 4.37 | 1.10 | 4.49 | 1.20 | 7.55 |
| Sale Yield (in %) | 204140 | 4.27 | 1.01 | 4.35 | 1.10 | 6.40 |
| Days To Sell | 71277 | 4.47 | 8.22 | 1.00 | 0.00 | 49.00 |
| Bond-level | | | | | | |
| Bond Amount (/1000000) | 317566 | 11.77 | 10.88 | 7.37 | 0.05 | 29.97 |
| Bond Maturity | 317566 | 20.84 | 8.55 | 21.50 | 1.00 | 30.50 |
| Issue-level | | | | | | |
| Callable | 317566 | 0.98 | 0.15 | 1 | 0 | 1 |
| Insured | 317566 | 0.62 | 0.48 | 1 | 0 | 1 |
| AAA-rated | 317566 | 0.61 | 0.49 | 1 | 0 | 1 |
| AA-rated | 317566 | 0.18 | 0.39 | 0 | 0 | 1 |
| Below AA | 317566 | 0.09 | 0.29 | 0 | 0 | 1 |
| Unrated | 317566 | 0.11 | 0.32 | 0 | 0 | 1 |
| Competitive Bid | 317566 | 0.07 | 0.26 | 0 | 0 | 1 |
| Sinking Fund | 317566 | 0.79 | 0.41 | 1 | 0 | 1 |
| Revenue Bond | 317566 | 0.97 | 0.18 | 1 | 0 | 1 |
| Pre-refunded | 317566 | 0.15 | 0.35 | 0 | 0 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| # of Underwriter Deals | 317566 | 33.01 | 26.27 | 26.00 | 0.00 | 104.00 |
| Students (/1000) | 317566 | 11.93 | 10.06 | 9.61 | 0.45 | 44.20 |
| Public | 317566 | 0.45 | 0.50 | 0 | 0 | 1 |
| Giving Per Student (/1000) | 248566 | 5.77 | 7.13 | 2.56 | 0.11 | 30.46 |
| HBCU | 317566 | 0.03 | 0.17 | 0 | 0 | 1 |

**Table 7. Analysis Of Seasoned Trades (Continued).**

Panel B: Transaction Costs

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Sample: | All | All | All | $< \$25,000$ | $\$25K - 100K$ | $\geq \$100K$ |
| | ΔPrice | ΔPrice | ΔPrice | ΔPrice | ΔPrice | ΔPrice |
| ΔTradesign | 0.93*** | 0.92*** | 0.93*** | 1.11*** | 0.79*** | 0.39*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| HBCU | | -0.05* | -0.04 | -0.08** | -0.02 | 0.09 |
| | | (0.03) | (0.03) | (0.03) | (0.05) | (0.11) |
| ΔTradesign×HBCU | | 0.13*** | 0.13*** | 0.08 | 0.17*** | 0.22*** |
| | | (0.05) | (0.05) | (0.05) | (0.06) | (0.06) |
| Log(Trade Size) | | | 0.02*** | 0.09*** | 0.01 | -0.05*** |
| | | | (0.00) | (0.01) | (0.01) | (0.01) |
| Log(Amount) | | | -0.01 | -0.01** | 0.00 | 0.00 |
| | | | (0.01) | (0.01) | (0.01) | (0.02) |
| Log(Maturity) | | | -0.04*** | 0.07*** | -0.09*** | -0.20*** |
| | | | (0.01) | (0.01) | (0.02) | (0.03) |
| Callable | | | -0.02 | -0.01 | -0.03 | 0.02 |
| | | | (0.02) | (0.03) | (0.04) | (0.06) |
| Insured | | | -0.01 | 0.01 | -0.05** | -0.16*** |
| | | | (0.01) | (0.01) | (0.02) | (0.05) |
| Competitive Bid | | | 0.01 | 0.02 | -0.01 | -0.02 |
| | | | (0.02) | (0.02) | (0.03) | (0.07) |
| Sinking Fund | | | -0.02 | -0.01 | -0.02 | -0.08** |
| | | | (0.01) | (0.01) | (0.02) | (0.04) |
| Revenue Bond | | | -0.03 | -0.06** | -0.03 | -0.05 |
| | | | (0.03) | (0.03) | (0.06) | (0.09) |
| Pre-refunded | | | 0.01 | 0.01 | 0.03 | 0.01 |
| | | | (0.01) | (0.01) | (0.02) | (0.05) |
| Log(# of Underwriter Deals) | | | -0.01** | -0.01* | -0.01 | -0.01 |
| | | | (0.00) | (0.00) | (0.01) | (0.01) |
| Log(Students) | | | 0.01** | 0.00 | 0.03*** | 0.05** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | (0.01) | (0.01) | (0.01) | (0.02) |
| Public | | | -0.00 | 0.01 | -0.04 | 0.02 |
| | | | (0.01) | (0.01) | (0.02) | (0.05) |
| Giving Rate Tercile (L) | | | -0.00 | 0.01 | -0.02 | -0.04 |
| | | | (0.01) | (0.01) | (0.02) | (0.05) |
| Giving Rate Tercile (M) | | | 0.02 | 0.02 | 0.01 | 0.05 |
| | | | (0.01) | (0.01) | (0.02) | (0.05) |
| Giving Rate Tercile (H) | | | 0.04*** | 0.04*** | 0.02 | 0.01 |
| | | | (0.01) | (0.01) | (0.03) | (0.05) |
| Rating FE? | Yes | Yes | Yes | Yes | Yes | Yes |
| State-YR FE? | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 317557 | 317557 | 317557 | 186655 | 95358 | 35517 |
| $R^2$ | 0.427 | 0.427 | 0.427 | 0.544 | 0.352 | 0.148 |

**Table 7. Analysis Of Seasoned Trades (Continued).**

Panel C: Purchase Yields, Sales Yields, And Days To Sell Determinants

| | (1) Purchase Yield | (2) Purchase Yield | (3) Sale Yield | (4) Sale Yield | (5) Days To Sell | (6) Days To Sell |
|---|---|---|---|---|---|---|
| HBCU | 0.37*** | 0.25** | 0.08 | 0.09 | 1.20*** | 1.31*** |
| | (0.12) | (0.13) | (0.08) | (0.11) | (0.44) | (0.46) |
| Log(Trade Size) | | -0.11*** | | -0.05*** | | 0.52*** |
| | | (0.01) | | (0.00) | | (0.04) |
| Log(Amount) | | -0.02 | | -0.01 | | -1.07*** |
| | | (0.01) | | (0.01) | | (0.05) |
| Log(Maturity) | | 0.84*** | | 0.93*** | | 0.68*** |
| | | (0.03) | | (0.03) | | (0.10) |
| Callable | | -0.03 | | -0.09 | | 0.26 |
| | | (0.08) | | (0.07) | | (0.44) |
| Insured | | 0.12** | | 0.03 | | -0.15 |
| | | (0.05) | | (0.05) | | (0.19) |
| Competitive Bid | | -0.19*** | | -0.11** | | -0.76*** |
| | | (0.05) | | (0.05) | | (0.26) |
| Sinking Fund | | 0.06 | | 0.07** | | -0.04 |
| | | (0.04) | | (0.03) | | (0.15) |
| Revenue Bond | | 0.13 | | 0.08 | | 0.36 |
| | | (0.09) | | (0.07) | | (0.33) |
| Pre-refunded | | -0.04 | | -0.04 | | -0.16 |
| | | (0.05) | | (0.05) | | (0.14) |
| Log(# of Underwriter Deals) | | 0.00 | | 0.01 | | 0.18*** |
| | | (0.01) | | (0.01) | | (0.05) |
| Log(Students) | | -0.04* | | -0.02 | | -0.24*** |
| | | (0.02) | | (0.02) | | (0.08) |
| Public | | 0.01 | | -0.04 | | -0.06 |
| | | (0.05) | | (0.05) | | (0.21) |
| Giving Rate Tercile (L) | | -0.08* | | -0.07* | | -0.24 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (0.04) | | (0.04) | | (0.17) |
| Giving Rate Tercile (M) | | -0.15*** | | -0.14*** | | -0.34* |
| | | (0.05) | | (0.04) | | (0.20) |
| Giving Rate Tercile (H) | | -0.29*** | | -0.26*** | | -0.38** |
| | | (0.05) | | (0.05) | | (0.19) |
| Constant | 4.35*** | | 4.27*** | | 4.44*** | |
| | (0.03) | | (0.03) | | (0.07) | |
| Rating FE? | No | Yes | No | Yes | No | Yes |
| State-YR FE? | No | Yes | No | Yes | No | Yes |
| Observations | 113426 | 113410 | 204140 | 204131 | 71277 | 71266 |
| $R^2$ | 0.003 | 0.424 | 0.000 | 0.504 | 0.001 | 0.059 |

**Table 8. Insurance Company Holdings.**

For this table our sample is limited to only university bonds held by NAIC firms for the years 2001 – 2010. For each state, we calculate the annual dollar amount held of bonds issued by HBCUs and non-HBCUs located within that state. Columns 1 and 2 then report the time-series average of these holdings for non-HBCUs (Column 1) and HBCUs (Column 2). For both of these columns, the percent of average holdings per state relative to average holdings across all states is reported in parentheses. We interpret these percentages as the portfolio weights by issuer state for a randomly selected portfolio of university bonds. For example, the holdings of a randomly selected university bond portfolio should consist of approximately 2.92% of Alabama, non-HBCU bonds, and 0.50% of Alabama, HBCU bonds. Next, for each state, we calculate the annual dollar amount held by NAIC firms domiciled within that state for bonds issued by a different state than the NAIC firm's state (Column 4), for bonds issued by a non-HBCU located within the same state as the NAIC firm (Column 5), and for bonds issued by an HBCU located within the same state as the NAIC firm (Column 6). In each of these columns, the relative percentage held of these three different categories is reported in parentheses. For example, the university bond holdings for NAIC firms headquartered in Alabama consists of 87.33% bonds issued by schools located outside of Alabama, 12.67% bonds issued by non-HBCUs located in Alabama, and 0% bonds issued by HBCUs located in Alabama.

| (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|
| State | Bond Supply by State | | Bond Demand (Holding) by State | | |
| | Non-HBCU | HBCU | Out-of-State | In-State Non-HBCU | In-State HBCU |
| AK | 0.00 (0.00%) | 0.00 (0.00%) | 7.89 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| AL | 110.15 (2.92%) | 18.90 (0.50%) | 11.03 (87.33%) | 1.44 (12.67%) | 0.00 (0.00%) |
| AR | 33.23 (0.88%) | 0.47 (0.01%) | 1.24 (61.49%) | 0.38 (38.51%) | 0.00 (0.00%) |
| AZ | 190.00 (5.04%) | 0.00 (0.00%) | 26.44 (99.32%) | 0.18 (0.68%) | 0.00 (0.00%) |
| CA | 141.91 (3.76%) | 0.00 (0.00%) | 123.91 (89.10%) | 10.14 (10.90%) | 0.00 (0.00%) |
| CO | 39.20 (1.04%) | 0.00 (0.00%) | 2.96 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| CT | 43.17 (1.14%) | 0.00 (0.00%) | 405.86 (99.66%) | 2.01 (0.34%) | 0.00 (0.00%) |
| DC | 28.36 (0.75%) | 63.12 (1.67%) | 1.46 (86.59%) | 0.00 (0.00%) | 0.02 (13.41%) |
| DE | 0.00 (0.00%) | 0.00 (0.00%) | 146.54 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| FL | 40.54 (1.07%) | 0.00 (0.00%) | 39.31 (96.80%) | 0.69 (3.20%) | 0.00 (0.00%) |
| GA | 89.95 (2.38%) | 13.45 (0.36%) | 8.17 (72.94%) | 1.73 (27.06%) | 0.00 (0.00%) |
| HI | 0.00 (0.00%) | 0.00 (0.00%) | 4.19 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| IA | 15.59 (0.41%) | 0.00 (0.00%) | 22.41 (90.16%) | 1.88 (9.84%) | 0.00 (0.00%) |
| ID | 39.46 (1.05%) | 0.00 (0.00%) | 2.74 (41.81%) | 2.72 (58.19%) | 0.00 (0.00%) |
| IL | 291.83 (7.73%) | 0.00 (0.00%) | 656.35 (94.16%) | 45.54 (5.84%) | 0.00 (0.00%) |
| IN | 171.60 (4.55%) | 0.00 (0.00%) | 253.16 (99.20%) | 2.08 (0.80%) | 0.00 (0.00%) |
| KS | 8.77 (0.23%) | 0.00 (0.00%) | 3.45 (76.43%) | 1.42 (23.57%) | 0.00 (0.00%) |

| | | | | | |
|---|---|---|---|---|---|
| KY | 66.86 (1.77%) | 0.00 (0.00%) | 0.00 (0.00%) | 3.90 (100.00%) | 0.00 (0.00%) |
| LA | 59.86 (1.59%) | 8.22 (0.22%) | 3.32 (17.65%) | 14.99 (82.35%) | 0.00 (0.00%) |
| MA | 311.65 (8.26%) | 0.00 (0.00%) | 177.19 (93.87%) | 12.33 (6.13%) | 0.00 (0.00%) |
| MD | 38.76 (1.03%) | 0.00 (0.00%) | 47.40 (96.65%) | 3.26 (3.35%) | 0.00 (0.00%) |
| ME | 5.03 (0.13%) | 0.00 (0.00%) | 7.92 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| MI | 81.87 (2.17%) | 0.00 (0.00%) | 39.12 (80.65%) | 5.90 (19.35%) | 0.00 (0.00%) |
| MN | 10.30 (0.27%) | 0.00 (0.00%) | 89.15 (97.17%) | 1.31 (2.83%) | 0.00 (0.00%) |
| MO | 118.29 (3.14%) | 0.00 (0.00%) | 80.96 (88.35%) | 9.70 (11.65%) | 0.00 (0.00%) |
| MS | 27.87 (0.74%) | 6.92 (0.18%) | 17.58 (69.87%) | 6.34 (28.16%) | 0.57 (1.97%) |
| MT | 1.47 (0.04%) | 0.00 (0.00%) | 0.33 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| NC | 284.95 (7.55%) | 0.25 (0.01%) | 66.03 (88.64%) | 9.37 (11.11%) | 0.20 (0.25%) |
| ND | 1.39 (0.04%) | 0.00 (0.00%) | 0.16 (38.16%) | 0.09 (61.84%) | 0.00 (0.00%) |
| NE | 39.46 (1.05%) | 0.00 (0.00%) | 4.40 (43.10%) | 2.99 (56.90%) | 0.00 (0.00%) |
| NH | 8.42 (0.22%) | 0.00 (0.00%) | 78.66 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| NJ | 219.92 (5.83%) | 0.00 (0.00%) | 27.25 (78.95%) | 9.05 (21.05%) | 0.00 (0.00%) |
| NM | 0.07 (0.00%) | 0.00 (0.00%) | 0.00 (0.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| NV | 0.84 (0.02%) | 0.00 (0.00%) | 4.49 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| NY | 132.99 (3.52%) | 0.00 (0.00%) | 361.41 (90.78%) | 32.42 (9.22%) | 0.00 (0.00%) |
| OH | 364.42 (9.66%) | 0.00 (0.00%) | 124.27 (80.54%) | 33.55 (19.46%) | 0.00 (0.00%) |
| OK | 10.79 (0.29%) | 0.00 (0.00%) | 29.39 (99.60%) | 0.25 (0.40%) | 0.00 (0.00%) |
| OR | 16.01 (0.42%) | 0.00 (0.00%) | 3.99 (82.44%) | 0.73 (17.56%) | 0.00 (0.00%) |
| PA | 153.77 (4.08%) | 0.00 (0.00%) | 161.35 (98.21%) | 3.35 (1.79%) | 0.00 (0.00%) |
| RI | 39.41 (1.04%) | 0.00 (0.00%) | 36.97 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| SC | 3.13 (0.08%) | 0.00 (0.00%) | 10.54 (98.79%) | 0.20 (1.21%) | 0.00 (0.00%) |
| SD | 1.33 (0.04%) | 0.00 (0.00%) | 9.82 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| TN | 22.19 (0.59%) | 5.78 (0.15%) | 32.51 (68.84%) | 4.82 (25.14%) | 0.95 (6.02%) |
| TX | 175.38 (4.65%) | 4.28 (0.11%) | 39.86 (75.82%) | 9.44 (23.32%) | 0.53 (0.86%) |
| UT | 37.30 (0.99%) | 0.00 (0.00%) | 1.20 (100.00%) | 0.00 (0.00%) | 0.00 (0.00%) |
| VA | 35.32 (0.94%) | 1.54 (0.04%) | 1.90 (42.60%) | 2.60 (57.40%) | 0.00 (0.00%) |
| VT | 34.86 (0.92%) | 0.00 (0.00%) | 5.54 (96.54%) | 0.28 (3.46%) | 0.00 (0.00%) |
| WA | 44.44 (1.18%) | 0.00 (0.00%) | 57.86 (98.49%) | 0.49 (1.51%) | 0.00 (0.00%) |
| WI | 44.68 (1.18%) | 0.00 (0.00%) | 269.31 (90.11%) | 22.28 (9.89%) | 0.00 (0.00%) |
| WV | 5.30 (0.14%) | 0.00 (0.00%) | 1.49 (74.30%) | 0.31 (25.70%) | 0.00 (0.00%) |
| WY | 8.02 (0.21%) | 0.00 (0.00%) | 0.93 (44.83%) | 1.15 (55.17%) | 0.00 (0.00%) |
| Total | 3650.11 (96.74%) | 122.93 (3.26%) | 3509.42 (93.01%) | 261.35 (6.93%) | 2.27 (0.06%) |

# Appendix

**Table A1. Variable Definitions.**

This table reports variable definitions. Data sources include the National Center for Education Statistics' Delta Cost Project Database (DCPD), the Security Data Corporation's Global Public Finance Database (SDC), municipal bond transaction data from the Municipal Security Rulemaking Board (MSRB), Mergent's Municipal Bond Securities Database (Mergent), and Arizona State University's Measuring University Performance Database (MUP).

| Variable | Description | Source |
|---|---|---|
| Gross Spread | Also known as the underwriter's discount, the gross spread represents the difference between the expected offer price and the price the underwriter pays for the issue (i.e. proceeds to the school), all scaled by the price the underwriter pays for the issue. | SDC |
| Amount (/1000000) | Dollar amount of the issue divided by one million. The log of this number is used as a control in regression analysis. | SDC |
| Max Maturity | Maturity of the bond with the longest maturity in the issue. Maturity is measured in years. The log of this number is used as a control in regression analysis. | SDC |
| Callable | Dummy variable that equals 1 if the issue is callable, and is 0 otherwise. | SDC |
| Insured | Dummy variable that equals 1 if the issue is insured, and is 0 otherwise. | SDC |
| Insurer | Issue insurer. In the event of multiple insurers, the first insurer listed is designated as the issue's insurer and the others are disregarded. This variable is used to construct insurer fixed effects. | SDC |
| Issue Rating | Rating of issue on day of issue. Used to construct rating fixed effects and the following dummy variables used in summary statistics tables: AAA rated, AA rated, Below AA, and Unrated. | SDC |
| Competitive Bid | Dummy variable that equals 1 if the if the issue is sold to underwriters on a competitive basis, and is 0 otherwise. | SDC |

| | | |
|---|---|---|
| Sinking Fund | Dummy variable that equals 1 if the issue has an attached sinking fund, and is 0 otherwise. | SDC |
| Revenue Bond | Dummy variable that equals 1 if the issue is a revenue bond, and is 0 otherwise. | SDC |
| Pre-refunded | Dummy variable that equals 1 if the issue has been entirely refunded, and is 0 otherwise. | SDC |
| Underwriter Deals | The number of deals recorded in the sample that the underwriter has underwritten over the past five years. The variable used in the regressions is Log(1 + # Underwriter Deals). In the event of multiple underwriters, the first underwriter listed is designated as the issue's underwriter and the others are disregarded. | SDC |
| Students (/1000) | The number of full-time equivalent students attending the issue's associated school in the year before the issue year. | DCPD |
| Public | A dummy variable that equals 1 if the issuing school is public, and is 0 otherwise. | DCPD |
| Giving Per Student (/1000) | The average annual alumni giving per student by the issuing school. The data for this variable is unbalanced across time and schools, thus we use the average over all years for each school using whatever data is available, i.e. this measure is time invariant. This variable is used to construct giving rate terciles. | MUP, DCPD |
| HBCU | Dummy variable that equals 1 if the bond issuer is an historically black college or university, and is 0 otherwise. | DCPD |

| | | |
|---|---|---|
| High Racial Animus | A dummy variable that equals 1 if the issuer is located in a "high racial animus" state, i.e., if the issuer is located in Mississippi, Alabama, or Louisiana, and is 0 otherwise. High racial animus states are those which rank in the top 10 among all states in all four of the following racial animus metrics: (1) the proportion of whites in the state who express "racial resentment' or (symbolic racism) (CCES Survey, Ansolabehere 2012); (2) the proportion of whites in the state who say that they support affirmative action (CCES Survey, Ansolabehere (2012)); (3) the percent of Google search queries within the state that include racially charged language (Stephens-Davidowitz 2014); (4) the percent of racist Tweets within the state following Barack Obama's re-election in 2012 (Zook 2012). | Multiple Sources |
| <u>Bond-level</u> | | |
| Bond Amount (/1000000) | Individual bond dollar amount divided by one million. The log of this number is used as a control in regression analysis. | Mergent |
| Bond Maturity | Individual bond maturity measured in years. The log of this number is used as a control in regression analysis. | Mergent |
| <u>Trade-level</u> | | |
| Markup (bps) | The bond's dealer sale price divided by the bond's re-offering price (i.e., the bond's price listed in the issue's official statement) divided by the bond's re-offering price. | MRSB, Mergent |
| Offering Price | The bond's re-offering price (i.e., the bond's price listed in the issue's official statement). | Mergent |
| Sale Price | The bond's dealer sale (customer purchase) price. | MRSB |
| Days Since Offering | The number of day's since the bond's offering date. | MRSB |
| Trade Size (/1000) | Bond trade dollar amount divided by one thousand. The log of this number (undivided) is used as a control in regression analysis. | MRSB |

| | | |
|---|---|---|
| ΔPrice (in %) | The percentage change in a bond's trading price relative to its previous trading price excluding interdealer trades. | MRSB |
| ΔTradesign | The change in the variable Tradesign, which is an indicator variable that equals one for dealer sells (customer purchases) and negative one for dealer purchases (customer sells). | MRSB |
| Purchase Yield | Purchase yield for purchases from customers, winsorized at 1% and 99% levels. | MRSB |
| Sale Yield | Sales yield for sales to customers, winsorized at 1% and 99% levels. | MRSB |
| Days To Sell | Number of days between purchase from customer until complete sale of purchased inventory to customers. Only populated for trades where the uninterrupted sequence of sales following a purchase provide an exact match between units purchased and units sold. Winsorized at 1% and 99% levels. | MRSB |

**Table A2. Schools Comprising the Treatment Effects Matching Estimator Sample.** This table reports the individual schools represented in the treatment (HBCU) and control (non-HBCU) groups analyzed in Table 3. Schools are listed by state and in ascending order based on the number of unique HBCUs represented in each state.

| State | Treatment Schools (HBCUs) | Control Schools (non-HBCUs) |
|---|---|---|
| DC | Howard University | American University |
| TX | Texas Southern University | St Marys University |
| MD | Morgan State University | Maryland Institute College of Art, Villa Julie College |
| KY | Kentucky State University | Morehead State University, Northern Kentucky University |
| LA | Dillard University, Xavier University of Louisiana | Loyola University New Orleans, Louisiana State University |
| MS | Jackson State University, Mississippi Valley State University | University of Southern Mississippi |
| VA | Hampton University, Norfolk State University, Virginia State University | James Madison University, Marymount University, Randolph-Macon College, Virginia Wesleyan College |
| FL | Bethune Cookman College, Edward Waters College, Florida Memorial University | Carlos Albizu University, Florida Institute of Technology, The University of Tampa |
| AL | Stillman College, Alabama State University, Alabama A&M University, Tuskegee University | Jacksonville State University, Randolph-Macon College, Samford University, Troy University, University of North Alabama, The University of Alabama, University of South Alabama |
| GA | Morehouse College, Morehouse School of Medicine, Fort Valley State University, Albany State University, Clark Atlanta University | Agnes Scott College, Berry College, Georgia Institute of Technology, Georgia Southern University, Georgia State University, Wesleyan College |
| NC | Winston-Salem State University, Saint Augustines College, North Carolina A&T State University, Fayetteville State University, Elizabeth City State University | Methodist College, North Carolina Wesleyan College, University of North Carolina at Asheville, University of North Carolina at Pembroke |