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 higher underwriting fees to issue tax-exempt bonds, compared to similar non-HBCUs. This appears to reflect higher costs of finding willing buyers: the effect is three times larger in the far Deep South, where racial animus remains the most severe. Credit quality plays little role. For example, identical differences are observed between HBCU and non-HBCUs: 1) with AAA ratings, and/or 2) insured by the same company, even before the 2008 Financial Crisis. HBCU-issued bonds are also more expensive to trade in secondary markets, and when they do, sit in dealer inventory longer.

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1 Introduction

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. To further illustrate the intuition, he writes:

> "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 (p. 109)."

One reason this example resonates is because bread consumers and wheat growers don't directly interact. Moreover, because bread is a commodity – contrast this with watching a baseball game or listening to recorded music – the product itself reflects virtually nothing about the producer itself. Together, these factors anonymize buyers and sellers, and consequently, limit the extent to which prices can reflect consumers' preferences over personal attributes.

This paper explores a setting that, if Friedman's argument is correct, would seem equally unlikely to exhibit 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 impersonal, and the product (an interest payment) is, if it arrives, indistinguishable between payers. These factors, coupled with competition, should force prices to reflect fundamentals, and little else.[1]

We collect a 23-year (1988-2010) sample of 4,145 tax-exempt municipal bond issues by 965 four-year college and universities, totaling approximately $150 billion. Of these, 102 were

[1]Becker (1957) theorized that competition should reduce the expression of racial discrimination. Ashenfelter and Hannan (1986) find that competition in the banking sector decreases gender discrimination, and Heywood and Peoples (1994) and Peoples and Talley (2001) find that the deregulation of the trucking industry increased the relative wage rates of black workers. See also Black and Strahan (2001) and Levine, Levkov, and Rubinstein, (2014)).

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. We explore whether HBCUs pay more to access capital markets than otherwise similar peers, and if so, why. As with most discrimination studies, the key empirical challenge is attributing any differences to taste-based versus statistical discrimination (Phelps (1972), Arrow (1973)) which, in our context, would involve investors finding HBCU-bonds less attractive for reasons other than their explicit affiliation with racial minorities.

Our analysis begins when bonds are issued. Like most initial public stock offerings for corporations, financial intermediaries play a prominent role in the issuance of municipal bonds. Typically, an underwriter first purchases bonds from a university, and then resells them to public investors over the next few days. This price difference, known as the *gross spread* or *underwriter spread*, compensates underwriters for the cost of placing the issue with investors.

On average, HBCUs pay higher underwriting spreads than non-HBCUs. For the typical non-HBCU, 81 cents out of every $100 raised flows to underwriters. The average for HBCUs is 11 basis points higher, at 92 cents per $100 dollars raised. We propose a race-based search cost explanation: investors face tax incentives to own local bonds, and because HBCUs are located in states with high levels of anti-Black racial animus, underwriters face steep frictions when trying to find willing buyers.

There are, of course, other potential reasons why HBCU bonds might be harder to sell. Fortunately, as researchers, we observe nearly all, and likely more of, the variables that would be available to underwriters and investors. Our estimations control for: 1) bond features such as the amount raised, maturity, and call provisions, 2) measures of underwriter quality and experience, 3) school metrics like student size, and alumni giving rates, and 4) potentially dynamic regional characteristics through $state \times year$ fixed effects. Despite the combination of these controls explaining about two-thirds of the total variation in underwriter spreads, the estimated premium paid by HBCUs is similar, if not slightly larger (16 basis points) than the unconditional difference.

Although the key source of risk in most debt markets – being paid late or not at all – is negligible for municipal bonds (Ang, Bhansali, and Xing (2014), Bergstresser and Cohen (2011)), we pay special attention to the possibility that HBCUs may have, or are perceived to have, higher credit risk. Our first test limits the sample to bonds with AAA credit ratings which, given that no AAA-rated municipal bond has ever failed to pay on time, should remove most of the heterogeneity in default risk. Yet, among this reduced sample (about 40% of the data), the HBCU effect is still relatively constant (15 basis points). Second, we consider only insured deals, and compare HBCU and non-HBCU bonds insured by the same entity. Among this sample, HBCUs pay a premium of 18 basis points; excluding the Financial Crisis of 2008 and afterward gives a nearly identical estimate (17 basis points).

The stability of the HBCU coefficient across specifications suggests that remaining heterogeneity between HBCUs and non-HBCUs is unlikely to explain the difference in underwriting spreads. We follow Oster (2015) to formally diagnose the importance of unobservables. Under 'equal selection,' in which observables and unobservables have the same proportional influence on the treatment effect (here HBCU status), the estimated impact of unobservables in our setting is worth at most 2-3 basis points, and likely less.

Perhaps the strongest evidence for taste-based discrimination involves a comparison *within* the set of HBCUs. If racial animus is the primary reason why HBCU-issued bonds are harder to place, then these frictions should be magnified in states where anti-Black racial resentment is most severe. We measure racial animus using survey responses (e.g., to questions about affirmative action), racially charged Google searches (Stephens-Davidowitz (2014)), white vote share for Barack Obama in the 2008 election, and geocoded racist tweets following the re-election of Barack Obama in 2012 (Zook (2012)). Alabama, Mississippi, and Louisiana earned the dubious distinction as having the highest levels of anti-Black racial animus in the U.S., with a sharp break between these and the fourth (Georgia).[2]

[2]When ranked on these measures of racial animus, from 1^{st} (most animus) to 51^{st} (least), Louisiana's sum of the ranks is 11, with Mississippi at 15, and Alabama at 17.5. The next state is Georgia (38), followed

When we reestimate our fully specified models and compare the underwriter spreads for HBCUs located in Alabama, Mississippi, and Louisiana to those in other states, the results are remarkable. Outside these three states, HBCUs pay 11 basis points more in gross spreads compared to non-HBCUs. However, within Alabama, Mississippi, and Louisiana – representing 26% of HBCU issuances – the premium triples (32 basis points). Importantly, this difference is limited to HBCUs: among non-HBCUs, the same cross-state comparison shows virtually no difference (2 basis points).

For robustness, we also ask whether HBCU-issued bonds face higher transactions costs in secondary market trading, typically occurring years after the initial issuance. This not only provides external validity using a different sample, but represents the strongest case against efficiency differences and/or exploitation by primary market underwriters driving our benchmark findings. On average, HBCU-issued bonds are about 20% more expensive to trade in secondary markets, with larger orders ($50,000 or above) facing the steepest costs (60% premium). HBCU-issued bonds also tend to sit in dealer inventory about 25% longer – again, with larger orders taking the most time to trade – perhaps the most direct evidence of intermediaries facing elevated search costs.

Does the fact that some investors appear to discriminate against HBCU bonds imply that non-discriminators get a good deal by buying them? When we test for yield premia for HBCU bonds, the point estimate is positive, but is fairly small and not significant. While this may seem at odds with our findings on underwriting spreads, if financial intermediaries are fairly compensated for linking sellers to buyers willing to pay the best – even fair – prices, price discounts need not be observed in equilibrium.

Drawing an analogy with the labor literature, this non-result is consistent with Becker's (1957) observation that it is the *marginal* rather than *average* level of discrimination prevailing in a market that determines wages, recently confirmed empirically by Charles and Guryan (2008). Because HBCUs constitute such a small share of the bond universe, the

by Arkansas (44), and Tennessee (46.5).

marginal investor may be willing to pay full value, reducing the price difference that would otherwise be observed. Of course, the absence of a discount in no way implies that discrimination costs are nil: higher search costs are ultimately born by HBCUs, in the same way that Black workers may have to look harder to find a job (Bertrand and Mullainathan (2004)), even if the wages they ultimately earn are identical.

Our paper directly contributes to the literature on racial discrimination in financial markets. Relevant work here includes studies of racial disparities in approval rates[3] and pricing of residential mortgages.[4] Other financial markets with evidence of racial discrimination include the peer-to-peer lending market (Pope and Sydnor, 2011), and a small but growing literature examining discrimination in small business lending.[5] Additionally, although their primary interest is not discrimination, Bergstresser, Cohen, and Shenai (2013) find that municipal bonds issued by regions fractionalized (i.e., heterogeneous) in terms of either race and/or religion trade at discounts, which they attribute to market inefficiencies. Our study complements these by providing evidence of discrimination in an important sector of the municipal bond market. Moreover, because HBCUs disproportionately serve a disadvantaged group of students with limited alternatives, inadequate school funding could cause some students to forego post-secondary education altogether.

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 4 characterizes the increase in transactions costs (underwriter spreads) faced by HBCUs when issuing bonds to the public. This section also contains a regional comparison,

[3]Surveys on these topics include Yinger (1996), Ladd (1998), Lacour-Little (1999), Dymski (2006), and Ross (2006).

[4]Haughwout, Mayer, and Tracy (2009) finds limited evidence of pricing discrimination in subprime loans originated in the years leading up to the 2008 financial crisis. 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.

[5]Bates (1991), finds that relative to similar white-owned firms, black-owned firms are less capitalized and receive smaller loan amounts, which subsequently translates into higher failure rates. Cavalluzzo and Cavalluzzo (1998) find large differentials in loan denial rates for female- and minority-owned small businesses. Blanchflower, Levine, and Zimmerman (2003) find that Black entrepreneurs are roughly twice as likely to be denied credit, and are charged higher interest rates for approved loans.

asking whether HBCUs located in the far Deep South pay a particularly high price to access municipal bonds. Section 5 considers robustness and other issues. In Section 6, we discussion potential remedies and conclude.

2 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, educational opportunities for blacks in the southern slave states were extremely rare and generally illegal. To combat this inequality, a small number of institutions were organized during the Antebellum period to offer elementary- and high school-level instruction specifically to black students. These institutions later developed into full-fledged post-secondary institutions, and are generally considered the first HBCUs.[6]

The number of HBCUs grew rapidly shortly after the end of the Civil War, often by way of northern religious missionary organizations establishing new institutions in the former slave states. While another surge in HBCU founding came following the passage of the second Morrill Act in 1890, which forced each state to either desegregate their land-grant colleges established by the first Morrill Act in 1862, or establish a separate land-grant college for students of color. Almost all southern and southern-border states opted for the latter option, which led to the creation of 16 exclusively black land-grant institutions.

The Higher Education Act of 1965, which defined and mandated direct federal aid to HBCUs provided the formal definition of 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

[6]The first HBCU was organized in 1837 by a group of Philadelphia Quakers. Initially called The Institute for Colored Youth, the school has since been renamed Cheyney University and is in operation today. Roughly 20 years later, two others were formed: Lincoln University (Pennsylvania) in 1854 and Wilberforce University (Ohio) in 1856.

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. In 1980 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," and 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 the Reverends Martin Luther King, Jr. (Morehouse College) and Jesse Jackson (North Carolina A&T), Spike Lee (Morehouse College), and Oprah Winfrey (Tennessee State University).[7]

3 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. There are three dates, $t = 0$, 1, and 2. Each bond has a face value \$1, and realizes risky payoffs at $t = 2$. With risk-neutral probability q, the $t = 2$ payoff is zero. With a risk-free rate of zero, and no search costs or other frictions, the price of the bond would be $1 - q$ at all dates. Trade takes places at both $t = 0$ and $t = 1$, and is intermediated.

[7] See Fryer and Greenstone (2010) for a general, contemporary examination of HBCUs.

At $t = 0$, a broker/dealer purchases a bond from the issuer, and at $t = 1$ sells it to a retail investor. The model characterizes how search frictions influence the prices at which bonds will be transacted at $t = 0$ and $t = 1$.[8]

We model search frictions 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.[9] The cost of supplying effort is $k + e$, reflecting both a fixed and variable cost. Moreover, the returns to effort increase with γ, intended to capture search costs related to selling a bond. For example, high values of γ might correspond to bonds issued in poor states with few potential investors; or, bonds with high default risk, or contractual features that make them unattractive to investors may increase search costs.

Consider first the effort choice by the broker/dealer underwriting the bond issue at $t = 1$. Having purchased Q units of the bond at price P_{buy} at $t = 0$, its profits are $\Pi(e) = Q[1 - q - \frac{\gamma^2}{e} - P_{buy}] - (k + eQ)$ which, when optimized with respect to e, gives equilibrium effort level $e^* = \gamma$. Bonds with a thick pool of potential investors require little 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 $P^*_{sell} = 1 - q - \gamma$.

Backing up to $t = 0$, and assuming perfect competition between underwriters, we can derive the maximum price a broker/dealer would be wiling to pay by setting $\Pi(e^*)$ equal to zero, which gives $P^*_{buy} = 1 - q - 2\gamma - \frac{k}{Q}$ and round-trip transaction cost of

$$P^*_{sell} - P^*_{buy} = \gamma + \frac{k}{Q}. \tag{1}$$

[8]Harris and Piwowar (2006), Ang and Green (2011), and Schultz (2012) document that bond transactions costs, i.e., the price differential between the $t = 0$ and $t = 1$ price, are among the highest of all financial assets, with round-trip trading costs on the order of 150-300 basis points.

[9]Modeling the search problem with discounts is simply 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.

Our central hypothesis is that HBCU-issued bonds, due to in-state investors being disinclined to own them, face elevated search frictions, i.e., γ is higher because of racial discrimination. The key empirical challenge, as Equation (1) highlights, is distinguishing this effect from other reasons that HBCU-issued bonds may be more difficult to sell (i.e., differences in γ for non-racial factors), trade size (Q) and underwriting efficiency (k).

4 Do HBCUs pay higher fees to issue bonds?

4.1 Data

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.[10] 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.[11] 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

[10] Our sample ends in 2010, as this was the most recent school data available in DCPD when we assembled our datasets. 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)).

[11] This information is obtained from a deal's official statement. We include an example of an official statement from our sample in appendix Figure A1. Circled in red are some highlights of the deal: the credit rating (AAA), insurer (Ambac), nominal deal amount ($44,060,000)), sample of an individual bond within a package (CUSIP 704646AA6), and underwriter spread.

issuers classified as universities, for which the main use of proceeds is higher education, and gross spreads are not missing. We 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." We eliminate these schools because they are many times very small, and in turn raise capital jointly with other educational entities in the municipality to reap economies of scale. Our analysis requires issuances backed solely by a single school, which eliminates an additional 11 issuances where the backer is denoted "various." 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.[12] We identify 102 HBCU bond issuances, each of which is listed in Figure 1. Of the remaining 5,940 non-HBCU issuances, 4,071 are unique issuers, the rest being either non-identifiable or issued by multiple entities. After trimming an additional 28 issues due to missing values for student enrollment, our final dataset consists of 4,145 bond issuances, 4,043 (102) issuances pertaining to non-HBCUs (HBCUs), and representing 920 (45) unique institutions. In the average year, about 190 bond issuances are sold to the public, with about 5 originating from HBCUs. Appendix Table A1 tabulates the time-series patterns of issuances for HBCUs and non-HBCUs separately.

4.2 Underwriting costs

When universities issue bonds, underwriters are employed to both structure the deal and market it to investors. To do this, underwriters issue university debt in packages consisting of multiple bonds of varying amounts, maturities, and other features (Ang and Green (2011)). Thus, for our primary market analysis, we analyze underwriter pricing at the package level, with our sample consisting of the 4,145 deals listed in Table 1.[13]

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

[13] Of these 4,145 deal-level observations, 228 are issued by the school as part of a larger multi-part deal, so that they share an official statement with at least one other deal. To account for a potential lack of

In practice, 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 (1), higher values for search costs will be reflected in a larger spread between the price at which the bond package is purchased from the issuer and sold to investors. At the time bonds are issued, the precise value of this quantity cannot be calculated, since the underwriter has not yet sold, or "re-issued" the bonds to investors. Accordingly, underwriters provide an estimated selling price for each security in a package called an *offering price*, which accounts for prevailing rates, issuer risk, the timing and amount of cash flows, call provisions, and other relevant attributes. Underwriters are compelled by the Internal Revenue Service to "make a bona-fide effort to sell a substantial fraction of the bonds at a offering price (Schultz (2012))," although excess (insufficient) demand for a given bond issue may cause actual selling prices to deviate from offering prices.

We assume that the offering price is a good approximation for eventual sales price, and confirm this assumption is valid in section 5.2. Accordingly, we focus on the difference between offering and purchases prices – known in the bond industry as the *underwriter spread* or *gross spread* – as our measure for issuance costs.[14] This is our preferred measure because is it publicly disclosed in the offering's official statement, and is observable at the time of issue.

Gross spreads are reported in basis points, as a fraction of either the bond's par value or proceeds. We use the latter normalization, noting that because bonds are typically priced close to par, the estimates would be similar in either case. Table 1 indicates that among university-issued bonds, the average gross spread is 81 basis points, nearly identical to O'Hara's (2012) estimate for the universe of all municipal bonds issued during this time

independence within these multi-deal issuances, in all analysis, we cluster the residuals by school issuance date.

[14]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).

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, totaling almost $150 billion over the entire sample. Nearly all deals feature call provisions (90%), and over half (56%) of the issuances are insured, with 42% securing AAA ratings, 17% with AA ratings, and the balance of deals either rated below AA (14%) or remaining unrated. Sinking fund provisions (61%) 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.[15]

The last few rows list summary statistics for underwriters and issuers. The average number of underwriters in the syndicate is approximately two. The total number of university-issued deals by all members of the syndicate over the past five years in our sample (e.g. for issuances in 1997, considering total issuances during 1993-1997) was 78 deals, on average. 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. Table 1 foreshadows our regression results, where HBCU gross spreads are higher by 11 basis points ($t = -2.40$, $p = 1.6\%$), 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 the number of past deals by the underwriting syndicate (HBCU underwriters appear less experienced). HBCUs are also more likely to be public, suggesting that they may receive less state funding than non-HBCU peer schools (Boland and Gasman,

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

2014).

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.

4.3 Regression results

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

$$Gross\ Spread = \alpha_0 + \alpha_1 \cdot HBCU + \beta_1 \cdot Bond\ Characteristics + \beta_2 \cdot School\ Characteristics + \beta_3 \cdot State \times Year\ Fixed\ Effects + \varepsilon \quad (2)$$

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. Our hypothesis predicts a positive sign on the HBCU coefficient, α_1, as it represents the incremental 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, column 1 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.

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. Because of tax motivations, there is strong incentive for municipal bond investors to reside in the same state as the issuer (Schultz (2013)). Consequently, placing bonds in larger and/or richer states may be easier for underwriters, resulting in lower gross spreads. Given HBCUs are regionally concentrated amongst some of the poorest states in the U.S., perhaps the *HBCU* indicator captures, in whole or part, cross-state heterogeneity in wealth, size, education, tax rates, political stability (Butler et al. (2009)), 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 basis points ($t = -4.11$, $p < 0.1\%$).[16] 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.

Bond characteristics. Column 3 adds to the regression controls for issue size and other features of the issue, including the credit rating if one exists (and an indicator for no rating otherwise), insurance, and sinking fund provisions. The 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), as do revenue bonds, which are backstopped by the cash flows of particular projects rather than the university as a whole. 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 at 19

[16] The reason that the estimated coefficient increases is that HBCU-issued bonds are disproportionately issued from states in which gross spreads for *non-HBCUs* are lower than average. Specifically, over half (58 out of 102) of HBCU-issued bonds are issued in Alabama, Georgia, Mississippi, North Carolina, and Virginia, where the average gross spread for non-HBCUs is 71 basis points. Including *state* fixed effects rather than *state* $\times$ *year* results in an estimated coefficient on the *HBCU* indicator of 18 basis points.

basis points ($t = -3.92$, $p < 0.1\%$).

Underwriters. Recall from Table 1 that HBCUs tend to use underwriting syndicates with less experience, with the typical HBCU syndicate having participated in 55 combined deals over the most recent five years, versus 78 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 efficiency.

In particular, larger syndicates 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).[17] 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.[18]

To accommodate potential differences in marginal costs (h_i), we include in column 4 the number of university deals done by all members of the syndicate (in total) over the most recent five years. Consistent with Butler (2008), we observe a strong negative relation between the number of deals and gross spreads, suggesting that syndicates with more (aggregate) experience may have a cost advantage. On the other hand, after controlling for experience, gross spreads are positively associated with the number of underwriters in a syndicate, which may reflect higher total fixed costs (k_i above). Indeed, we observe a strongly positive relation with gross spreads, consistent with this interpretation. In any case, neither control has much

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

[18] Bergstresser, Cohen, and Shenai (2013) find that issuers from more ethnically and religiously fractionalized counties pay higher yields on their municipal debt. They find some evidence that this is due to less efficient monitoring of the bond underwriting process.

of an effect on the HBCU coefficient, which remains stable at 18 basis points ($t = -3.77$, $p < 0.1\%$).

School quality and alumni wealth. Cash flow 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, such as the small and provincial HBCUs.

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 $state \times year$ 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 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.[19] Compared to schools with no data on giving (the base case), schools in the top (middle) tercile experience a spread reduction of 9 (6) basis points. However, the bottom tercile of schools reporting giving rates are statistically indistinguishable from 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 fourth and fifth 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 ($t = -3.45$, $p < 0.1\%$) more to issue bonds, an increase of about 20% relative to the unconditional average gross spreads of non-HBCU

[19] 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.

issuers.

Credit risk. HBCU-issued bonds may have, or are perceived to have, elevated credit risk, either through higher default or lower recovery rates. Although columns 3 – 5 already include multiple controls for default risk (e.g., credit ratings, sinking fund provisions, school enrollment, etc.), these controls are likely imperfect. Columns 6 – 8 provide sharper tests to rule out residual concerns that HBCU-issued bonds are more likely than others to default.

Column 6 begins by considering only the subset of bond issuances that receive a credit rating of AAA (the highest possible rating) at issuance.[20] 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. Focusing on this sample should significantly limit any remaining heterogeneity in the credit risk of issuers. Despite cutting the sample by more than half, the estimated coefficient on $HBCU$ remains stable at about 15 basis points.[21] The reduction in statistical significance ($t = -2.05$, $p = 4.1\%$) is due mostly to reduced precision due to a smaller sample size ($4.7 \times \sqrt{\frac{4145}{1729}} \approx 7.3$).

Column 7 considers only insured bonds, and includes insurance company fixed effects. Accordingly, the average $HBCU$ effect is identified by comparing gross spreads for HBCUs and non-HBCUs commonly insured by the same entity. This renders school specific risk irrelevent as payments will be made by the insurance company in the event of default. Here too, we observe a nearly identical magnitude as before, with gross spreads for HBCU-issued bonds being 18 basis points higher ($t = -3.44$, $p < 0.1\%$). Lest one be concerned about bond

[20] The three primary credit rating agencies differ in their nomenclature, with Standard and Poor's and Fitch using all capital letters (e.g., AAA, AA), and Moody's using a combination of upper and lower case letters, and sometimes with numbers (e.g., Aaa, Aa1). Throughout the paper, we report ratings using the former convention, relying on the close correspondence between the Moody's classification scheme and that of the other two.

[21] Note that several of the coefficients become insignificant or even flip sign relative to previous columns. For example, neither *Revenue Bond* nor *Sinking Fund*, both measures of creditworthiness, are significant, suggesting that both are subsumed by a AAA rating. Also, the estimated coefficient on *Insured* becomes positive in this sample, indicating that among AAA-rated bonds, selling costs are lower for issuers with AAA ratings themselves, as opposed to obtaining this rating via insurance. Whether this represents differences in perceived credit risk, school quality, or other factors that influence investor willingness to pay, 100% of the HBCU-issued bonds with AAA ratings are insured, so that the coefficient on *Insured* has no impact on the HBCU coefficient.

insurance being less credible during and after the Financial Crisis of 2008, column 9 repeats the specification, but only for years 2007 and prior. Again, the coefficient and statistical significance remains virtually unchanged at 17 basis points ($t = -3.15$, $p = 0.2\%$).

4.3.1 Matched pairs

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 issue, based on statistically significant univariate differences (at the 10% level) between HBCUs and non-HBCUs in Table 1. To minimize credit risk differences, we first condition into a high credit quality subsample ($N = 2,845$) where the issuance was rated AAA or AA at issuance, and if not rated, was insured. We then match to the nearest neighbor on issue size, school enrollment, alumni giving rates, bond insurance, and the year of issue. We require exact matches on state of issue and public school status. Successful matches were obtained in 71 cases. In the first two columns of Table 3 Panel B, 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.

Panel A of Table 3 reveals the average treatment effects on the treated ($HBCU$), after bias adjustment for continuous covariates (Abadie and Imbens (2011)), is 21.5 basis points ($p < 0.1\%$), slightly larger than results shown in Table 2. This result mitigates concerns about OLS not allowing for a sufficiently flexible relation between gross spreads and the relevant covariates. An additional benefit is this exercise is that it allows us to 'name' the HBCU matches, which are listed in Table A4 of the Appendix. Generally, non-HBCU controls are small, regional, and relatively obscure, e.g., University of Montevallo (AL), Rollins College (FL), Agnus Scott College (GA), and Berry College (GA). This helps address concerns about school attributes and/or reputation – beyond their impact on credit risk –

conflating the relation between HBCU status and gross spreads.

4.3.2 Remaining unobservables

Oster (2015) builds upon Altonji, Elder and Tabler (2005) by deriving a bias-adjusted true treatment effect in the presence of unobservables (α^*) as a function of estimated treatment effects (in our case α, the HBCU coefficient) and model explanatory power (R^2) without and with controls. This calculation requires an assumption about the coefficient of proportionality in the proportional selection relationship (δ), and an assumption about the hypothetical explanatory power of a regression that includes both observables and unobservables (R_{max}).

Treatment effect estimates and model explanatory power without (with) controls are presented in Table 2 Column 1 (5). We assume equal selection ($\delta = 1$), implying unobservables are not more important than observables in explaining the treatment. We have no theory to guide appropriate assumptions about R_{max}, and so consider the following of values tending toward full explanatory power: 0.70, 0.80, 0.90 and 1.00. Using these inputs, we calculate bias adjusted treatment effects (α^*) of 16.63, 17.37, 18.10 and 18.84, respectively. This implies that under the most conservative R_{max} upper bound of full explanatory power, the bias due to unobservables $18.84 - 16.25 = 2.6$ basis points. Not only is this effect small in magnitude, but the bias does not inflate our coefficient estimate. Rather, the correction would result in a larger, not smaller, estimated treatment (HBCU) effect.

4.4 Geographical variation in racial animus

To this point, we have compared gross spreads between HBCUs and non-HBCUs, tests vulnerable to criticisms about unobserved heterogeneity between them. Our analysis in this section compare gross spreads *within* the family of HBCU-issued securities. We 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.[22]

To measure variation in racial animus across states, we derive a composite of five variables. The first two metrics, racial resentment and opposition for affirmative action, are derived from the Cooperative Congressional Election Study (CCES, Ansolabehere (2012)). The CCES is a large survey of American adults by county, and recent research links current 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 fourth measure compares the state-level white vote share for Democratic presidential nominee Barack Obama in 2008 to the white vote share for the 2004 Democratic nominee John Kerry. Vote share is measured from exit polling of Edison/Mitofsky with larger decreases capturing more animus. 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 animus) to 51 (lowest animus). We designate states ranking in the top 10 on each of the five metrics as "high racism" states. Appendix Table A2 provides the complete ranking, from which a structural break separating Louisiana, Mississippi and Alabama from Georgia and the other states is clearly apparent.[23] Table A2 also reveals that while these states account for only 4.7% of all university issuances, they are home to over one-fourth (26%) of issuances by HBCUs.

Figure 2 shows the basic result. In the left hand side, we plot the average gross spreads for non-HBCUs (dark gray, 81 basis points) and HBCUs (light gray, 87 basis points) for states

[22] 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 (2008)) and differential access to credit card financing by black entrepreneurs (Chatterji et al. (2012)).

[23] This break occurs primarily because the states remain "demographically unchanged" with the majority of the whites being Southern born, compared with, say Georgia, where a much larger fraction of whites are non-native and not culturally Southern (Tilove, 2008).

other than Louisiana, Mississippi, and Alabama. The right hand side of the figure plots this same difference ($106 - 82 = 24$ basis points) for these three states. The first noteworthy observation is that the difference is over three times larger in states with high levels of racial animus (24 vs. 7 basis points). Second, spreads for non-HBCU schools are essentially the same in the left and right hand sides the figure (81 vs. 82 basis points), suggesting that the difference in differences is driven almost entirely by changes in HBCU gross spreads.

These differences strengthen slightly when controls are added. Column 1 of Table 4 shows the results of re-estimating the fully controlled model shown in column 6 of Table 2, while allowing the HBCU coefficient to vary between high- and low-racial animus states.[24] The non-interacted HBCU coefficient is 11 basis points, indicating that in states such as Pennsylvania, North Carolina, and Florida, HBCUs still pay a significant premium to issue bonds. However, the coefficient on the $HBCU \times High\ Animus$ interaction is 21 basis points, significant at the 8% level in a two-tailed hypothesis test, and 4% in a one-tailed test.[25] This incremental effect implies that in high animus states, HBCUs are charged approximately 32 basis points, roughly three times that observed in low-animus states.

To ensure these inferences are not simply an artifact of forcing the other covariates to have the same slopes in both the high and low animus subsamples, in columns 2 and 3 we re-estimate the model separately in high and low animus states. The results mimic those shown in column 1, where we observe an HBCU effect of about 11 basis points ($t = 2.24$) in low animus states, and 29 basis points ($t = 2.38$) among high racism states.[26]

[24]Note that because the regression include $state \times year$ fixed effects, a dummy variable capturing high animus states cannot be estimated.

[25]Because this is a directional hypothesis, one could argue that a one-tailed test ($p = 0.04$) may be more appropriate. See Pfaffenberger and Patterson (1987) and Cho and Abe (2013).

[26]Note that all bonds in the high-animus sample are revenue bonds, which results in this variable dropping out of the estimation.

5 Robustness and other considerations

The analysis thus far has focused on the interaction between HBCUs and bond underwriters. We saw that HBCUs pay more in underwriting costs – particularly in the far Deep South – little of which appears to reflect issuer or bond fundamentals. In this section, we continue to trace the flow of bonds, first from underwriters to investors trading in the secondary market (5.2), and then months or even years later, between investors (5.3). These additional tests establish robustness to our benchmark findings, provide perspective into the role played by financial intermediaries, and allow us to consider a richer set of outcome variables, such as the time required for a dealer to re-sell a bond (section 5.4). In section 5.5, we relate our findings to the literature on labor market discrimination, drawing on Becker (1957).

5.1 Trade-level data

All analysis prior to now has been conducted at the deal level.[27] The analysis in this section disaggregates observations into individual trades, using data extracted from the Municipal Securities Rulemaking Board (MSRB). The secondary trading sample begins January 31, 2005, and ends June 30, 2010.[28] We exclude dealer-to-dealer transactions in order to isolate trades involving retail customers, remove 5,705 duplicate trades, and winsorize price changes, par values, and sales yields at the 1% and 99% thresholds.

We create two trade-level datasets, which are analyzed in sections 5.2 and 5.3 respectively. The first is intended to track *newly issued* bonds, i.e., those that soon after being purchased by underwriters are placed with investors. Following Schultz (2012), this sample starts 25 days prior to the official issuance date, and ends 10 days afterward. The second sample

[27] This is the natural unit of observation, as a single gross spread is reported for each deal.

[28] 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.

contains only trades for *seasoned* bonds. For this sample construction, we follow Cestau, Green, and Schürhoff (2013) and consider all trades occurring 60 days (or more) after initial issuance. This permits comparison with their study, though alternative cutoffs (e.g., 10 days after issuance) make almost no difference to the results.

5.2 Markups on newly issued bonds

In section 4, we took gross spreads as our estimate for an underwriter's revenues when issuing a bond. But, recalling the discussion from section 4.2, gross spreads are calculated relative to the underwriters's estimate of the eventual selling price (the offering price), not the actual selling price. Specifically, for a given bond package, the underwriter's profit, $P_{sell}^{package} - P_{buy}^{package}$, can be decomposed as follows:

$$P_{sell}^{package} - P_{buy}^{package} = \big(\underbrace{P_{sell}^{package} - P_{offering}^{package}}_{markup}\big) + \big(\underbrace{P_{offering}^{package} - P_{buy}^{package}}_{gross\ spread}\big). \tag{3}$$

The second term is the gross spread. The first, known among municipal bond traders as the *markup,* measures the difference between the offering price and actual sales price.

To measure markups, we utilize the first of the two trade-level datasets described above. Panel A of Table 5 contains some summary statistics for individual trades. Focusing on the first five rows, note that relative to the analysis in Section 4, the number of observations is now much higher ($N = 116,905$), implying that on average, a bond package requires $\frac{116{,}905}{4{,}145} \approx 28.2$ trades to deplete underwriter inventory. The typical trade is \$343,000, and occurs 3 days after the issuance date. Note also that on average, sales occur at slight premia to both par (\$1.05 per \$100 notional value) and offering prices (\$101.05 - \$99.80 = \$1.25). Across all trades, the average markups relative to offering prices is 128 basis points.

Equation 3 shows that markups and gross spreads are substitutes. Thus, if markups for HBCU bonds are systematically higher or lower than for non-HBCU bonds, differences in underwriter revenues may not be well captured by differences in gross spreads. Panel B of Table 5 tests for this explicitly. The first row considers as the dependent variable each trade's *Markup* relative to the offering price. In addition to our coefficient of interest, the *HBCU* indicator, we also include the bond and issuer controls considered in our analysis of gross spreads (Table 2). The regressions further include trade-level controls for the par value of the transaction, and the time since the offer date, measured in days.

Our estimate of the coefficient on the HBCU indicator (0.68) is over twenty times less than the standard error of the estimate, suggesting no statistically significant difference in markups between HBCUs and non-HBCUs. Thus, even though *Markups* are positive on average, there is virtually no evidence that they are higher (or lower) for HBCU-issued bonds, and accordingly, allows us to focus on gross spreads (Table 2) as our measure of underwriting revenues.

The second and third columns disaggregate markups into its components considering, respectively, the offering price and (actual) transaction price for each trade. Conditioned on controls, the *HBCU* coefficient is far from significant, and with slightly positive point estimates for both. Thus, even though underwriting costs appear to be lower for HBCU-issued bonds, there is no evidence that transaction prices, or underwriter's expectation of them, are lower.

While these two phenomena may initially seem at odds, this is not necessarily the case. Foreshadowing our discussion in section 5.5, underwriting costs more closely indicate the *average* level of discrimination (i.e., how many investors must be approached before one is willing to buy) whereas prices reflect the discrimination of the *marginal* investor (i.e., the one who says yes). As Becker (1957) emphasizes, these may differ considerably in the cross-section, resulting in differential observed outcomes for search costs and prices.

5.3 Turnover costs among seasoned bonds

This section compares the transactions costs between HBCUs and non-HBCUs trades occurring months to years after the initial issue. We conduct this analysis for two reasons.

The first is for generalizability: if HBCU-issued bonds are more difficult to place initially, it stands to reason that they should be more difficult to place subsequently. The second reason is that by examining trades that do not involve the original issuer or underwriter, the concern that our benchmark findings in Section 4 reflect differential financial sophistication by the university and/or predatory pricing by underwriters is allayed.

To estimate transactions costs in secondary trades, we adapt the approach developed in Cestau, Green, and Schürhoff (2013), which tests for, and finds, elevated transactions costs of Build America Bonds, relative to other tax-exempt municipal bonds. In analogous fashion, we estimate:

$$\Delta P_i = \beta_0 + \beta_1 \Delta Tradesign_i + \beta_2 \Delta Tradesign_i \times HBCU + \beta_3 HBCU + \Gamma Controls_i + \varepsilon_i. \quad (4)$$

Each observation i corresponds to a trade. The average size of secondary market trades is \$236,000 (Panel A of Table 6), slightly lower than that for newly issued bonds.

For each trade-level observation, we calculate a percent price change, ΔP_i, relative to the most recently recorded price for the same bond. Prices are reported per \$100 par value. Each trade is also associated with a $Tradesign$, which takes a value of one for a customer purchase, a negative one for a customer sale, and zero otherwise. The total percentage wise transaction cost is thus given by $2\beta_1$.

We are mostly interested in the interaction between $HBCU$ and $\Delta Tradesign$, which estimates the additional cost of turning over an HBCU-issued bond. In addition to these variables, the regressions include *state* $\times$ *year* fixed effects, along with the same set of bond and issuance characteristics included in prior tables.

Panel B of Table 6 shows the results. Confirming prior work by Cestau, Green, and Schürhoff (2013), we estimate a coefficient on $\Delta Tradesign$ of 0.85, nearly identical to their estimate (0.88). More importantly, the $HBCU$ interaction term is positive (17 basis points) and significant ($p < 0.1\%$). As we found in the primary market, HBCU bonds in secondary markets are about 20% more expensive to trade, with dealers taking $(85 + 17) * 2 = 204$ basis points on a round trip, compared to 170 basis points for non-HBCU bonds.

Columns 2 and 3 present the results when broken down trade size. For trades less than \$50,000, round-trip costs are about 204 basis points, declining to 82 for trades exceeding \$50,000.[29] These results are consistent with the model presented in Section 3, which appeals to underwriters (dealers in this setting) facing fixed costs. Against this backdrop, it is interesting that the HBCU interaction coefficient, β_2, *increases* with size. For small trades, HBCU-issued bonds are about 10% more expensive to trade, but for large trades, the increase is $\frac{26}{41} = 63\%$.

Recall from the simple model (Section 3) that discounts D were inversely related to underwriter effort e, and varied directly with γ^2, a bond-specific scaling parameter intended to capture search costs. As γ increases, selling a bond for a given discount requires higher underwriter effort. However, in the benchmark case presented, this does not vary with the quantity being sold. In other words, there is no notion of 'saturation,' whereby search frictions become increasingly expensive as trade volume increases.

While this may be realistic if the pool of potential investors is large relative to the volume of bonds, this may not be the case for HBCU-issued bonds. Rather, after the first few bonds are sold, an already small pool of potential investors may quickly deplete, making it progressively more costly to find a willing buyer for the next. This can be accommodated by an extension to the basic model where the discount for HBCU-issued bonds is $\hat{D}(e) = \frac{\gamma^2}{e}Q^2$, such that discounts increase in trade size, Q. Transactions costs then become $\hat{P}^*_{sell} - \hat{P}^*_{buy} = \gamma Q + \frac{k}{Q}$, reflecting both the diminishing effect of fixed costs ($\frac{k}{Q}$), as well as the increasing effect of larger trade size (γQ).

[29]The p-value on the interaction between $HBCU$ and $\Delta Tradesign$ is 4.5% in column 2, and less than 0.1% in column 3.

5.4 Time in dealer inventory

The next three columns explore whether, when HBCU bonds trade, whether they sit in dealer inventory longer. If true, this would be the most direct evidence that financial intermediaries face higher search costs when attempting to place HBCU bonds with investors. Of the 140,825 bond purchases in our sample, we are able to precisely measure inventory time for 88,063 of them.

As shown in Panel A, the average bond sits in dealer inventory for a little more than four days, although this is highly right-skewed, with some trades happening the same day, and others taking more than a month. Column 4 of Panel B shows the results of a regression where the dependent variable is $Days\ In\ Inventory$. After controlling for the same variables in prior columns, we estimate that HBCU-issued bonds take an additional day to sell ($p =$ 0.6%), an increase of 23% relative to the unconditional sample average. Columns 5 and 6 show the results for small and small trades, using the same $50,000 cutoff. As with transactions costs, inventory times are most elevated for large (1.8 days, $p = 3.4\%$) versus small (0.7 days, $p = 0.7\%$) HBCU bond trades.

A natural question is whether, in the context of our simple model (Section 3), the magnitudes in columns 4-6 are consistent with those in columns 1-3. That is, in a framework where brokers compete away all profits, is the cost of an additional day in dealer inventory sufficiently high to justify an extra 34 basis points in broker commissions? The typical trade HBCU trade is $119,000, which multiplied by 0.34% gives about $400. With the caveat that we do not observe brokers' labor, capital (though this will be somewhat offset by the bond's interest), or other costs related to turning over a bond, $400 strikes us as being close to the value of a few hours of a trader's time. If true, then a competitive model with small rents accruing to brokers, versus one appealing to market power differences, may be sufficient.

5.5 Marginal versus average discrimination: Becker (1957)

We have thus far focused on the process linking bonds to investors. Here, we analyze the end point of this process, asking whether, conditioned on observables, investors pay lower prices (higher yields) for HBCU-issued bonds. Panel C of Table 6 presents the results of cross-sectional regressions where, rather than a buy-sell difference as in previous tables, the dependent variable ($Sales\ Yield$) is now a yield, expressed in basis points. Each observation corresponds to a sale from a broker/dealer to an investor.

Column 1 shows the results of univariate comparisons with no control variables. Although the estimate is positive (0.11 percentage points), it is not statistically significant. Controlling for the same set of controls in prior regressions (e.g., $state \times year$ effects, credit ratings, school attributes, bond features) explains almost 40% of the total variation in yields, but has little effect on the estimated HBCU coefficient, which remains economically small and statistically insignificant. As in Panel B, columns 3 and 4 show the results for small and large trades, respectively. In neither case do we estimate a significant effect, although the point estimate for large trades (16.7 basis points) perhaps suggests a discount for large HBCU orders.

This weak result for bond yields might seem inconsistent with investors discriminating against HBCUs. However, as Becker (1957) argues in the context of labor market discrimination, equilibrium wages for Black workers will represent the discriminatory taste of the marginal employer which, because Black workers constitute a relatively small fraction of the labor pool, may differ considerably from the taste of the average employer. A direct implication is that among a sample of employed Black workers – or in our context, successfully sold HBCU-issued bonds – market prices (wages, bond yields) may reveal little if any evidence of discrimination. Charles and Guryan (2008) test this implication of Becker, and find supporting evidence.

These results further illustrate the empirical challenges when attempting to estimate the all-in costs of discrimination. The problem here is one of selection: when a sale of an HBCU-issued bond occurs, this has already been conditioned on underwriters having found a willing buyer – perhaps out of state, as discussed shortly – and accordingly, having incurred the associated search costs. Nevertheless, small or even no discounts at sale neither implies that average discrimination is zero, nor that HBCUs are immune from the costs associated with overcoming it. Indeed, similar to Black workers having to look longer and/or harder to find a job (Bertrand and Mullainathan (2004)), the additional placement costs of HBCU bonds ultimately are born by the issuer.

Of course, selection effects may operate even further upstream, in the decision to issue bonds at all. Only about half (45) of the 88 four-year HBCUs raised capital from 1988-2010, with issuers having higher enrollments (11,000 versus 8,400 students) and total tuition revenue ($20 million versus $40 million). These observations alone do not imply an inefficiency, since the funding needs for non-issuers may be lower. However, either because smaller and/or lower quality HBCUs may be particularly unattractive to investors, or via fixed cost arguments, anticipated discrimination could cause some schools to forego the market altogether. To the extent that this is so, the total all-in costs of discrimination will be larger still.

6 Potential remedies

The paper concludes with a discussion of ways to alleviate the additional burden HBCUs face when attempting to access capital markets. Sections 6.2 and 6.1 describe, respectively, a pair of market-based solutions, and highlights why either or their combination may be insufficient to fully eliminated the problem. Possible policy interventions are then explored in section 6.3.

6.1 Out of state investors

If the key friction is that racial animus makes HBCU bonds unattractive to local (in state) investors, a natural solution would seem to be selling HBCUs to investors in other areas. The problem is that for the typical investor, buying a nonlocal bond – e.g., a resident of California purchasing a Grambling State University (Louisiana) bond – is associated with a tax penalty, and accordingly will demand a yield premium. Specifically, note that the required yield on HBCU bonds, r^{HBCU}, must be at least $\frac{r^*}{1-\tau^*}$, where r^* is the yield on bonds issued in the out-of-state investor's home state, and τ^* is his marginal state-tax rate.

The relevant question, from the perspective of an HBCU, is the size of τ^*, which determines the required premium to attract out of state investors. Statutory state-level tax rates range from 0% (e.g, Washington) to 13.3% (California), but because state taxes are deductible at the Federal level, marginal rates will be closer to 0-6%. Given that the typical yield on municipal bonds is about 4.2% over our sample, then if the marginal buyer faces a state tax rate in the middle of the distribution, the required yield premium is approximately $\approx 3\% \times 4.2\% \approx 13$ basis points.[30] Interestingly, this is in the neighborhood of the yield difference reported in Panel C of Table 6, suggesting that perhaps out-of-state investors may already participate to some extent already.

A lower bound for τ^* is of course zero, which would be the case if investors from zero or low tax states were sufficient to absorb most of the HBCU bond supply. Without data on the identities of investors, our ability to pinpoint whether, let alone which, non-local investors play an important role in this market. Still, it is worth noting that of the nine states with zero or near zero state income tax, half (Alaska, Nevada, South Dakota, Wyoming, and New Hampshire) are very small. Further, and ironically from the perspective of HBCUs, three of the remaining four (Florida, Texas, and Tennessee) rank in the highest quartile in terms of racial animus. Only Washington has both a low tax rate, and ranks low in anti-Black racial animus.

6.2 Local institutions

Throughout the paper, we have in mind that the central friction – racial bias – operates at the level of the individual investor. Yet, echoing an argument often raised in behavioral

[30] We thank Richard Roll for this observation.

finance, why don't arbitrageurs – with behavior presumably less influenced by biases – step in to eliminate, or at least mitigate, the problem? Possible candidates might include local banks, mutual funds, insurance companies, and even hedge funds.

The reason we are interested in *local* institutions per se is, following the discussion above, based on tax motivations. Institutions typically face incentives to own bonds issued within their state, although compared to individuals, the tax advantages are generally less beneficial.[31] Nonetheless, the question we ask in this section is whether local institutions step in to fill the demand gap presumably created by retail investors reluctant to own HBCU bonds.

To address this issue, we compare the percent of municipal bonds supplied (issued) by colleges in each state to the percent demanded (held) by its local insurers. To illustrate, suppose that across the U.S., Texas universities issue 5% of the total dollar volume of college-issued municipal bonds from 2001-2010. If Texas-domiciled insurance companies place 10% of their invested capital in Texas-based university bonds, this would suggest overweighting – *home bias* – of 2. The question we ask is whether this ratio differs between HBCUs and non-HBCUs. If the ratio for HBCUs exceeds 2 (in this example), it would suggest an institutional tilt toward HBCUs, and vice versa.

We obtain data on institutional investor holdings from insurance companies, which is provided by the National Association of Insurance Commissioners (NAIC), available for the years 2001-2010. For each year from 2001-2010, we aggregate all positions in any college-issued municipal bond from our set of 4,145 issuances. Then, using school location, we calculate the fraction of total supply originating from each state, for non-HBCUs and HBCUs separately. Table 7 lists the ten states in which at least one of its HBCUs: 1) issued a bond, and 2) is held in a portfolio by an insurance company within the U.S.

The table is best understood with an example. Columns 2 and 3 indicate that insurance companies, on average, own $154.68 million in notional value of bonds issued by non-HBCU

[31] Ang, Bhansali, and Xing (2010) study this issue explicitly, use the sensitivity of bond prices to personal income tax rates to conclude that retail investors "dominate dealers and other institutions" in determining prices and trading volume.

colleges in Georgia, corresponding to 3.55% of the (average) total amount of college-issued bonds held ($4.36 billion). Likewise, column 3 indicates that Georgia-based HBCUs account for $12.69 million, for 0.29% of this same total. Unsurprisingly, we see that the "other states" column contributes the majority of non-HBCU bond supply, but (by construction) zero percent for HBCU bonds.

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, $10.13 million dollars in any of the college-issued bonds constituting our sample. Of this, $8.26 (81.6%) 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 $1.87 million invested in Georgia-based non-HBCU schools, such as Georgia Tech University or University of Georgia. No insurance company in Georgia invested in a Georgia-based HBCU from 2001-2010.

Comparing the *percentage values* in columns 2 and 5 allow us to assess the extent to which insurance companies exhibit home bias. If positions were allocated in proportion to their total supply, we would expect for Georgia's insurance companies to invest 3.55% of its funds in Georgia-based HBCUs, and 0.29% in Georgia-based HBCUs. Instead, what we observe is extreme home bias for non-HBCUs – actual holdings are over an order of magnitude larger (18.43% versus 3.55%) than proportional allocation would prescribe – and inverse home bias for HBCUs, with 0% actually invested versus a prediction of 0.29%.

The findings for Georgia generalize. Columns 7 and 8 calculate the home bias, respectively, for non-HBCUs and HBCUs, for each of the ten states listed. The average (median) home bias for non-HBCUs is 22.54 (15.23), versus 8.14 (0.46) for HBCUs. 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., only Texas shows some slight favoritism for local HBCUs.

Together, the evidence in Table 7 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 4, 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.

6.3 Legislation

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.

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.

Federal intervention may, as a result, be a reasonable solution. The federal government has intervened in the past to support HBCUs under the Higher Education Act of 1965. To relax frictions HBCUs face in the bond market, the federal government could designate HBCU bonds as *triple tax exempt*, applying to Federal, state, and local taxes. Such a designation has precedent as a means to widen bond market participation in the US territories of Gaum and Puerto Rico, and would serve to lessen the geographic captivity HBCUs currently face.

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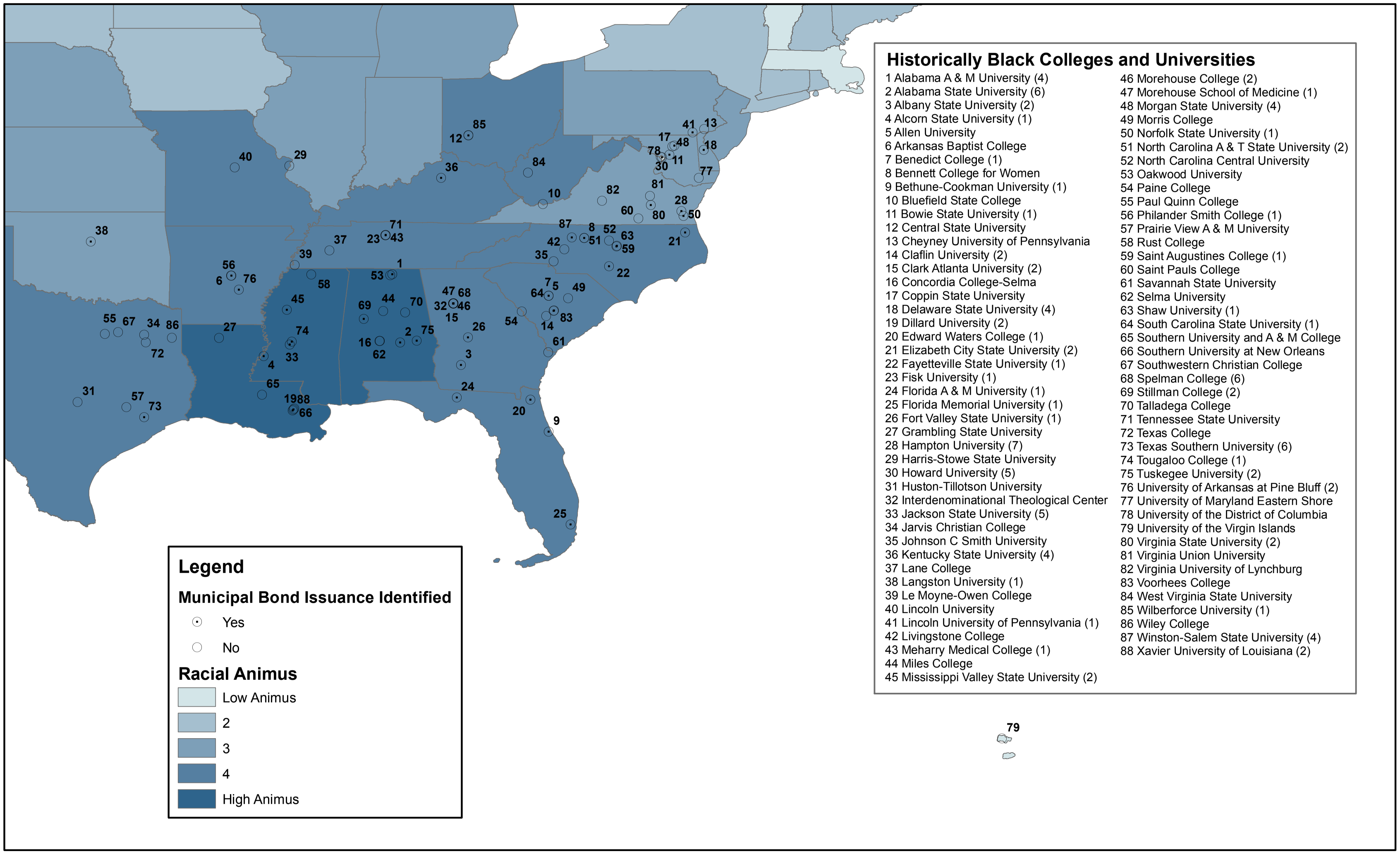

Figure 1. Four Year Historically Black Colleges and Universities 1988 – 2010 per Delta Cost Project Database. This figure plots the locations of all 4-year HBCUs in the Delta Cost Project Database over the 1988 – 2010 time period. Schools for which we can identify at least 1 municipal bond issuance in the SDC database over this same time period are marked with a circle with a dot in the middle, while those with no identifiable bond issuances are marked with a circle. School names are identified by number with the total number of issuances for each school indicated in parentheses. Levels of statewide racial animus (see Table A2) are indicated as specified in the figure's legend.

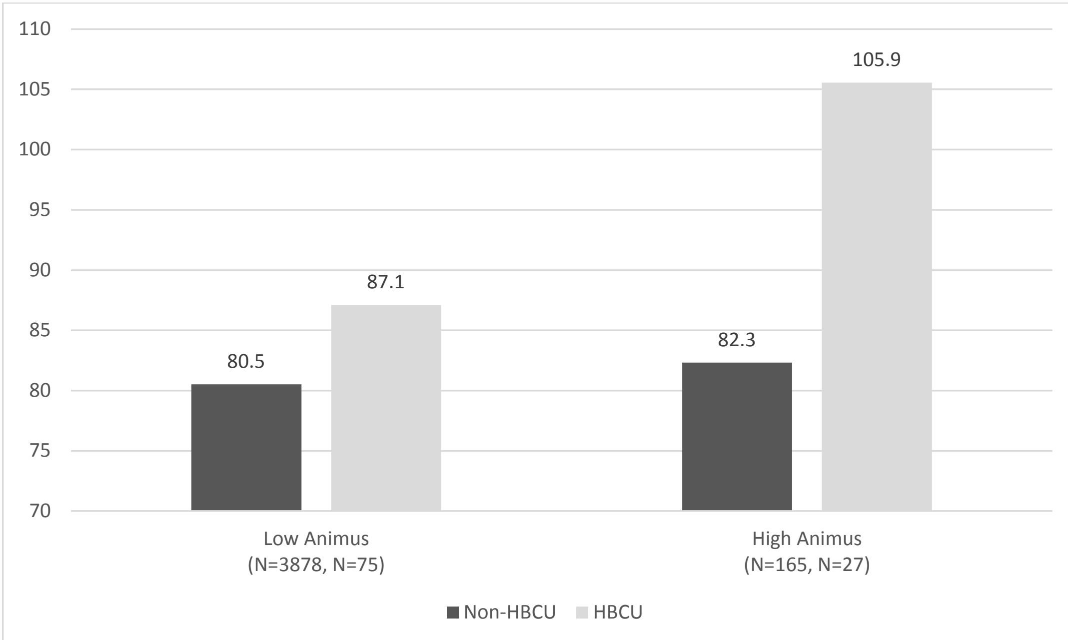

Figure 2. Average Gross Spreads. This figure plots the average gross spreads in basis points of bond issuances by HBCUs and Non-HBCUs located in states with high racial animus versus low racial animus.

Table 1. Bond Issuance Summary Statistics

This table reports descriptive statistics for our sample of university municipal bond issues. Statistics are reported for all issuances, and separately for HBCU and non-HBCU issuances, and include the total number of observations (N), mean, and standard deviation. The following issue-level variables are reported: 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), the total number of deals done within the sample by all members of the syndicate over the past five years (# of Underwriter Deals), the total number of underwriters in the syndicate (# of Underwriters), 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). Column 10 displays mean differences between HBCU and non-HBCU variables, followed by standard errors of the difference clustered by school-date.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	All			Non-HBCU			HBCU				
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Diff	SE
Gross Spread (bps)	4145	80.87	46.58	4043	80.59	46.59	102	92.06	45.05	11.47	4.78
Amount (/1000000)	4145	35.13	43.15	4043	35.38	43.55	102	25.24	19.30	−10.14	2.04
Max Maturity	4145	23.28	8.01	4043	23.26	8.05	102	24.03	6.25	0.77	0.65
Callable	4145	0.90	0.31	4043	0.90	0.31	102	0.91	0.29	0.01	0.04
Insured	4145	0.56	0.50	4043	0.55	0.50	102	0.80	0.40	0.25	0.25
AAA-rated	4145	0.42	0.49	4043	0.41	0.49	102	0.54	0.50	0.13	0.20
AA-rated	4145	0.17	0.38	4043	0.17	0.38	102	0.15	0.36	−0.02	0.28
Below AA	4145	0.14	0.35	4043	0.14	0.35	102	0.02	0.14	−0.12	0.71
Unrated	4145	0.27	0.44	4043	0.27	0.44	102	0.29	0.46	0.02	0.22
Competitive Bid	4145	0.09	0.28	4043	0.09	0.28	102	0.08	0.27	−0.01	0.45
Sinking Fund	4145	0.61	0.49	4043	0.61	0.49	102	0.64	0.48	0.03	0.21
Revenue Bond	4145	0.96	0.19	4043	0.96	0.19	102	1.00	0.00	0.04	–
# of Underwriter Deals	4145	77.84	82.46	4043	78.42	83.09	102	54.72	46.35	−23.70	4.81
# of Underwriters	4145	2.16	2.16	4043	2.16	2.17	102	2.14	1.61	−0.02	0.16
Students (/1000)	4145	9.79	10.03	4043	9.94	10.11	102	3.97	2.45	−5.97	0.30
Public	4145	0.40	0.49	4043	0.40	0.49	102	0.57	0.50	0.17	0.20
Giving Per Student (/1000)	2745	4.97	5.89	2683	5.04	5.92	62	1.91	3.38	−3.13	0.44

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.

	(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	21.06	18.61	17.97	16.25	14.95	17.97	17.13
	(4.78)	(5.12)	(4.75)	(4.77)	(4.71)	(7.31)	(5.23)	(5.44)
Log(Amount)			-11.79	-11.17	-9.54	-5.54	-6.09	-5.77
			(0.70)	(0.77)	(0.82)	(1.48)	(1.21)	(1.30)
Log(Maturity)			13.66	13.10	12.93	2.18	3.96	4.85
			(1.47)	(1.47)	(1.48)	(3.55)	(2.97)	(3.04)
Callable			6.05	6.25	6.23	4.63	4.17	4.21
			(2.33)	(2.32)	(2.34)	(3.66)	(3.44)	(3.58)
Insured			-9.23	-9.37	-12.70	11.17		
			(1.84)	(1.84)	(1.87)	(3.84)		
Competitive bid			3.38	3.96	3.00	-1.18	1.31	0.83
			(3.07)	(3.16)	(3.16)	(5.20)	(4.75)	(4.63)
Sinking fund			11.98	12.30	11.14	3.81	2.71	1.63
			(1.53)	(1.53)	(1.51)	(2.48)	(2.13)	(2.21)
Revenue bond			19.10	18.67	21.09	8.23	14.10	8.63
			(4.06)	(4.02)	(4.05)	(12.92)	(8.86)	(8.88)
Log(# of				-4.59	-4.16	-2.65	-2.16	-3.31
Underwriter Deals)				(0.87)	(0.88)	(1.37)	(1.12)	(1.21)
Log(# of				4.18	3.61	1.00	-1.15	0.41
Underwriters)				(1.40)	(1.40)	(2.31)	(2.04)	(2.06)
Log(Students)					-2.05	-2.18	-0.80	-0.97
					(0.87)	(1.41)	(1.33)	(1.43)
Public					8.62	10.79	9.44	9.85
					(2.13)	(3.87)	(3.09)	(3.19)
Giving Rate Tercile (L)					-2.23	-0.01	-1.46	-1.42
					(2.02)	(2.97)	(2.39)	(2.49)
Giving Rate Tercile (M)					-6.19	-3.17	-3.34	-3.77
					(1.99)	(3.32)	(2.63)	(2.72)
Giving Rate Tercile (H)					-8.82	1.57	-0.89	0.11
					(1.99)	(3.39)	(2.63)	(2.87)
Constant	80.59	80.35	47.26	63.09	76.59	84.57	133.06	148.24
	(0.76)	(0.58)	(4.52)	(5.49)	(8.19)	(19.04)	(16.44)	(17.27)
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	0.643	0.648	0.716	0.732	0.731

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 71 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. Matches are derived from the high credit quality subsample (rating of AAA, AA or unrated with insurance) using a nearest neighbor matching estimator (see Abadie and Imbens 2006) which matches on issue size, school enrollment, alumni giving rates, whether the bond was insured, and the year of issue. Exact matches were required on state and public school status. Individual schools backing the issuances analyzed here are listed in Appendix A4.

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

(1) ATET	(2) S.E.	(3) p-value	(4) 95% Conf. Interval
21.50	5.64	0.00	[10.45,32.55]

Panel B: Covariate Balance Diagnostics

	(1) HBCU Mean	(2) Non-HBCU Mean	(3) Standardized Difference	(4) Variance Ratio
Log(Amount)	3.04	3.16	-0.13	1.06
Log(# of Underwriter Deals)	3.61	3.67	-0.06	1.23
Insured	0.92	0.93	-0.05	1.18
Log(Students)	8.24	8.49	-0.32	0.51
Year	2000.80	2001.21	-0.08	1.17
Giving Rate Tercile (L)	0.41	0.63	-0.46	1.04
Giving Rate Tercile (M)	0.14	0.11	0.08	1.21
Giving Rate Tercile (H)	0.04	0.04	0.00	1.00
Giving Rate Not Reported	0.41	0.21	0.43	1.45

Table 4. High/Low Racial Animus By State And The HBCU Effect

This table reports the same model as in Table 2 with the added interaction of HBCU with High Animus, a dummy variable that equals one when an issuing-school is located in a high racial animus state identified in Table A2. Standard errors are in parentheses and are clustered by school-date.

	(1) Gross Spread	(2) Gross Spread	(3) Gross Spread
HBCU	11.06	11.02	28.51
	(4.92)	(4.91)	(11.94)
HBCU × High Animus	21.26		
	(12.33)		
Log(Amount)	-9.61	-9.24	-14.09
	(0.82)	(0.84)	(4.36)
Log(Maturity)	12.88	12.71	8.77
	(1.48)	(1.49)	(12.18)
Callable	6.33	6.73	-3.20
	(2.33)	(2.39)	(12.09)
Insured	-12.59	-12.65	-14.18
	(1.87)	(1.90)	(10.36)
Competitive bid	2.96	2.67	6.09
	(3.16)	(3.27)	(13.20)
Sinking fund	11.09	11.16	10.21
	(1.51)	(1.54)	(7.08)
Revenue bond	21.20	20.93	
	(4.05)	(4.05)	
Log(Students)	-2.04	-2.00	-10.23
	(0.87)	(0.88)	(8.17)
Log(# of Underwriter Deals)	-4.16	-4.50	0.43
	(0.88)	(0.91)	(4.07)
Log(# of Underwriters)	3.75	4.13	-5.02
	(1.39)	(1.43)	(6.15)
Public	8.67	8.17	37.30
	(2.13)	(2.16)	(16.22)
Giving Rate Tercile (L)	-2.29	-2.23	2.31
	(2.02)	(2.06)	(11.05)
Giving Rate Tercile (M)	-6.10	-5.65	-9.83
	(1.99)	(2.02)	(11.48)
Giving Rate Tercile (H)	-8.73	-8.77	13.33
	(1.99)	(2.00)	(19.20)
Constant	76.47	77.13	163.95
	(8.19)	(8.25)	(67.27)
Rating FE?	Yes	Yes	Yes
State-YR FE?	Yes	Yes	Yes
Observations	4145	3953	192
R^2	0.649	0.652	0.661

Table 5. Analysis of Newly Issued Bonds.

Panel A of this table reports descriptive statistics for the trade-level variables used to estimate the regressions reported in Panel B. Statistics for the bond-level and issue-level variables also used in these regressions are reported in Appendix Table A5. Issue-level controls are identical to the control variables reported in Table 2, while bond-level controls include days since offering, bond maturity, and bond amount, which are calculated at the bond level, not package level. 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 from 25 days prior to the offering date (the when issued period) to 10 days following the offering date, following Schultz (2012). Heteroscedasticity robust standard errors are double clustered on deal and day of trade and are reported in parentheses.

Panel A: Summary Statistics

	(1) N	(2) Mean	(3) SD	(4) Median	(5) Min	(6) Max
Trade-level						
Markup (bps)	116905	127.65	146.81	108.78	-1034.66	1652.12
Offering Price	116905	99.80	3.58	98.91	15.25	119.35
Sale Price	116905	101.05	3.07	100.00	16.12	119.10
Days Since Offering	116905	3.06	3.11	2	-25	10
Trade Size (/1000)	116905	343.72	1247.19	30.00	5.00	10850.00

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

	(1) Markup	(2) Offering Price	(3) Sale Price
HBCU	0.68	0.24	0.26
	(23.03)	(0.70)	(0.71)
Rating FE?	Yes	Yes	Yes
State-YR FE?	Yes	Yes	Yes
Trade-level Controls?	Yes	Yes	Yes
Bond-level Controls?	Yes	Yes	Yes
Issuance-level Controls?	Yes	Yes	Yes
Observations	116905	116905	116905
R^2	0.530	0.382	0.242

Table 6. Analysis Of Seasoned Trades.

Panel A of this table reports summary statistics for the trade-level variables used to estimate secondary market trading costs in Panel B. Summary statistics for additional bond- and issue-level variables also used in these regressions are reported in Appendix Table A6. Issue-level controls are identical to the control variables reported in Table 2, while bond-level controls include bond maturity and bond amount, which are calculated at the bond level, not package level. Columns 1 – 3 of Panel B reports regression estimates for the following equation:

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

where $\Delta Price$ is the percentage change in a bond's trade price, $\Delta Tradesign$ 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 defined in Appendix Table A3. Columns 4 – 6 report regressions of the number of days for a bond to completely leave dealer inventory (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, on $Controls$. 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 2, 3, 5, and 6 are further restricted by trade size. Columns 2 and 4 limit the sample to trades less than $50,000, and columns 3 and 6 to trades greater than $50,000. Panel C reports regressions of bond sale yields on HBCU and controls for the full sample and by trade size. Heteroscedasticity robust standard errors are double clustered on deal and day of trade and are reported in parentheses.

Panel A: Summary Statistics

	(1) N	(2) Mean	(3) SD	(4) Median	(5) Min	(6) Max
Trade-level						
Trade Size (/1000)	378079	236.43	1083.36	25	5	10850
Sale Yield (in %)	237254	4.21	1.04	4.27	0	6.46
Days to Sell	88063	4.24	7.97	1	0	48

Panel B: Transaction Costs and Time in Dealer Inventory

	(1)	(2)	(3)	(4)	(5)	(6)
	Transaction Costs			Time in Dealer Inventory		
Sample:	All	$\$5K - \$50K$	$\geq \$50K$	All	$\$5K - \$50K$	$\geq \$50K$
	ΔPrice	ΔPrice	ΔPrice	Days to Sell	Days to Sell	Days to Sell
ΔTradesign	0.85	1.02	0.41			
	(0.02)	(0.01)	(0.02)			
HBCU	0.004	-0.01	0.06	0.99	0.72	1.80
	(0.02)	(0.02)	(0.05)	(0.36)	(0.34)	(0.67)
ΔTradesign$\times$HBCU	0.17	0.10	0.26			
	(0.05)	(0.05)	(0.05)			
Rating FE?	Yes	Yes	Yes	Yes	Yes	Yes
State-YR FE?	Yes	Yes	Yes	Yes	Yes	Yes
Trade-level Controls?	Yes	Yes	Yes	Yes	Yes	Yes
Bond-level Controls?	Yes	Yes	Yes	Yes	Yes	Yes
Issuance-level Controls?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	378079	283238	94841	88063	62524	25539
R^2	0.400	0.500	0.165	0.051	0.045	0.084

Panel C: Sale Yields

	(1)	(2)	(3)	(4)
Sample:	All	All	$\$5K - \$50K$	$\geq \$50K$
	Sale Yield	Sale Yield	Sale Yield	Sale Yield
HBCU	0.11	0.09	0.07	0.17
	(0.09)	(0.10)	(0.10)	(0.15)
Rating FE?	No	Yes	Yes	Yes
State-YR FE?	No	Yes	Yes	Yes
School Controls?	No	Yes	Yes	Yes
Bond/Issuance Controls?	No	Yes	Yes	Yes
Underwriter Controls?	No	Yes	Yes	Yes
Observations	237254	237254	189151	48103
R^2	0.000	0.378	0.388	0.337

Table 7. Insurance Company Holdings.

For this table our sample is limited to only university bonds held by firms in the National Association of Insurance Commissioners (NAIC) database 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 2 and 3 then report the time-series average of these holdings for non-HBCUs (Column 2) and HBCUs (Column 3). 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 3.16% of Alabama, non-HBCU bonds, and 0.45% 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 90.24% bonds issued by schools located outside of Alabama, 9.76% bonds issued by non-HBCUs located in Alabama, and 0% bonds issued by HBCUs located in Alabama. Column 7 (8) reports the average home bias for Non-HBCU (HBCU) bonds calculated as the relative % of bonds held in column 5 (6) divided by the relative percentage of bonds supplied in column 2 (3). N/A indicates "Not Applicable".

(1) State	(2) Bond Supply by State	(3)	(4) Bond Demand (Holding) by State for HBCU States	(5)	(6)	(7) Home Bias	(8)
	Non-HBCU	HBCU	Out-of-State All	In-State Non-HBCU	In-State HBCU	Non-HBCU	HBCU
AL	137.64 (3.16%)	19.77 (0.45%)	14.37 (90.24%)	1.55 (9.76%)	0 (0.00%)	3.09	0
AR	52.19 (1.20%)	0.47 (0.01%)	1.19 (69.75%)	0.52 (30.25%)	0 (0.00%)	25.26	0
DC	33.54 (0.77%)	61.2 (1.40%)	1.33 (98.59%)	0 (0.11%)	0.02 (1.30%)	0.14	0.92
GA	154.68 (3.55%)	12.69 (0.29%)	8.26 (81.57%)	1.87 (18.43%)	0 (0.00%)	5.19	0
LA	66.7 (1.53%)	8.25 (0.19%)	3.24 (15.71%)	17.4 (84.29%)	0 (0.00%)	55.08	0
MS	26.46 (0.61%)	6.81 (0.16%)	18.68 (73.50%)	6.18 (24.33%)	0.55 (2.16%)	40.09	13.83
NC	278.22 (6.38%)	0.25 (0.01%)	74.85 (88.90%)	9.15 (10.87%)	0.2 (0.23%)	1.7	41.2
TN	23.45 (0.54%)	5.34 (0.12%)	33.52 (84.13%)	5.47 (13.74%)	0.85 (2.13%)	25.54	17.38
TX	223.38 (5.13%)	7.53 (0.17%)	43.76 (76.07%)	12.96 (22.53%)	0.8 (1.39%)	4.4	8.06
VA	37.85 (0.87%)	1.44 (0.03%)	1.87 (43.68%)	2.41 (56.32%)	0 (0.00%)	64.87	0
OTHER	3200.82 (73.44%)	0 (0.00%)	N/A	N/A	N/A	N/A	N/A
TOTAL	4234.91 (97.16%)	123.75 (2.84%)					
					Average	22.54	8.14
					Median	15.23	0.46
					% Zero	0	0.5

Appendix – For Online Publication

Table A1. Bond Issues by Year.

This table reports the annual number and percentage of bond issues by HBCUs and non-HBCUs.

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

Figure A1. 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 A1. 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.

Official Statement Page 62:

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 A2. 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 (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), column 5 ranks states by the decrease in the percentage of white vote share for black democratic presidential nominee Barack Obama relative to the white nominee John Kerry in the previous 2004 election. Vote share is compiled by Edison/Mitofsky exit polls (Tilove 2008). Column 6 ranks states by their level of racist Tweets following Barack Obama's re-election in 2012 (Zook 2012). Column 7 reports the sum across all ranks for each state. States ranking in the top 10 on all of the five racial animus metrics are designated as "high racial animus" states and their corresponding rows are highlighted in gray. Columns 8 and 9 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) Change in White Vote Share (Tilove 2008)	(6) Racially Charged Geocoded Tweets (Zook 2012)	(7) Sum of 5 Ranks	(8) # of Bond Issues in Total	(9) # of Bond Issues by HBCUs
LA	1	1	2	6	1	11	57	4
MS	2	3	4	2	4	15	46	9
AL	4	2	8.5	1	2	17.5	89	14
GA	3	4	16.5	3	11.5	38	99	14
AR	6	7	14.5	13.5	3	44	107	3
TN	11	6	11	7	11.5	46.5	59	2
WV	33	10	1	9	7	60	17	0
SC	7	5	8.5	23.5	29.5	73.5	52	4
FL	10	14	12.5	26	11.5	74	125	4
MO	18	25	18.5	8	11.5	81	165	0
KY	27	20	5	13.5	16	81.5	83	4
TX	5	8	27.5	26	16	82.5	121	6
OH	20	16	6.5	23.5	19	85	204	1
OK	9	15	22	36.5	11.5	94	60	1
NV	12	12	20	36.5	19	99.5	2	0
PA	19	23	3	32	23.5	100.5	334	1
NC	17	13	16.5	20	45	111.5	136	11
AZ	13	17	38	43	7	118	79	0
MD	30	28	24	16.5	23.5	122	40	5
NJ	24	30	10	36.5	23.5	124	136	0
MI	14	26	6.5	33	47.5	127	127	0

IL	28	34	22	20	23.5	127.5	151	0
ND	32	18	34.5	4.5	41.5	130.5	27	0
AK	15	22	40	47.5	7	131.5	0	0
KS	31	29	27.5	11	37.5	136	76	0
VA	21	24	29.5	20	41.5	136	79	10
ID	8	9	48	47.5	29.5	142	28	0
NE	26	19	33	28	37.5	143.5	64	0
CT	42	39	18.5	36.5	11.5	147.5	81	0
UT	22	33	51	4.5	41.5	152	40	0
NM	43	40	48	16.5	5	152.5	20	0
SD	25	11	40	47.5	29.5	153	6	0
WI	37	37	25.5	13.5	41.5	154.5	34	0
DE	38	27	22	26	45	158	9	4
NY	41	41	12.5	41.5	23.5	159.5	283	0
IA	34	31	36	40	19	160	111	0
IN	23	21	25.5	41.5	50	161	157	0
RI	40	44	14.5	47.5	16	162	57	0
MN	45	43	45	10	23.5	166.5	64	0
WY	16	32	42.5	47.5	29.5	167.5	8	0
NH	35	38	34.5	31	29.5	168	32	0
CO	29	35	48	13.5	45	170.5	58	0
CA	39	42	31	36.5	34	182.5	204	0
ME	46	46	32	30	34	188	9	0
WA	44	45	40	29	34	192	72	0
MT	36	36	42.5	47.5	37.5	199.5	15	0
MA	48	49	37	36.5	29.5	200	223	0
DC	51	51	46	20	37.5	205.5	31	5
OR	47	47	44	20	47.5	205.5	33	0
VT	50	50	29.5	47.5	49	226	32	0
HI	49	48	50	47.5	51	245.5	3	0

Table A3. 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 (bps)	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. Reported in basis points (bps).	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
# of Underwriter Deals	The sum of the number of deals in the sample underwritten by each member of the underwriter syndicate over the past 5 years. The variable used in the regressions is Log(# of Underwriter Deals).	SDC

# of Underwriters	The number of underwriters in the underwriting syndicate. The log of this number is used as a control in regression analysis.	SDC
Students (/1000)	The number of full-time equivalent students attending the issue's associated school in the year before the issue, divided by one thousand. The log of this number (undivided) is used as a control in regression analysis.	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 divided by one thousand. 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 decrease in white vote share in 2008 for Barack Obama relative to John Kerry in 2004, measured using Edison/Mitofsky exit poll data collected from nytimes.com in 2008 and nbcnews.com in 2004; (5) the percent of racist Tweets within the state following Barack Obama's re-election in 2012 (Zook 2012).	Multiple Sources As Cited in Description
<u>Bond-level</u>		
Bond Amount (/1000000)	Individual bond dollar par amount divided by one million. The log of this number (undivided) is used as a control in regression analysis.	Mergent

Bond Maturity	Individual bond maturity measured in years. The log of one plus this number is used as a control in regression analysis.	Mergent
<u>Trade-level</u>		
Markup (bps)	The bonds sale price less the bonds re-offering price (i.e. the bond's price listed in the issue's official statement) divided by the bond's re-offering price, expressed in basis points. Observations where the ratio of dealer sale price to re-offering price is less than 0.80 or greater than 1.20 are deleted, following Schultz (2012).	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 par value trade amount divided by one thousand and winsorized at the 1% and 99% levels. 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, winsorized at the 1% and 99% levels.	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), following Cestau et al. (2013).	MRSB
Sale Yield (in %)	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 A4. 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	Stephen F Austin State University, Texas State University - San Marcos, Texas A&M University, University of North Texas
MD	Morgan State University	St. Mary's College of Maryland
KY	Kentucky State University	Morehead State University, Northern Kentucky University
LA	Dillard University, Xavier University of Louisiana	Loyola University New Orleans, Louisiana College
AL	Alabama State University, Alabama A&M University	Jacksonville State University, Troy University, University of Montevallo, University of North Alabama
MS	Jackson State University, Mississippi Valley State University, Alcorn State	Delta State University, University of Southern Mississippi, Mississippi State University
VA	Hampton University, Norfolk State University, Virginia State University	James Madison University, Shenandoah University, Christopher Newport University
FL	Bethune Cookman College, Edward Waters College, Florida Memorial University	Stetson University, Rollins College, Carlos Albizu University - Miami
NC	Winston-Salem State University, North Carolina A&T State University, Fayetteville State University, Elizabeth City State University	University of North Carolina at Asheville, University of North Carolina at Pembroke, University of North Carolina at Wilmington
GA	Morehouse College, Morehouse School of Medicine, Spelman College,Fort Valley State University, Albany State University, Clark Atlanta University	Agnes Scott College, Berry College, Emory University, Kennesaw State University, Savannah College of Art and Design

Table A5. Analysis of Newly Issued Bonds (Unreported Results).
Panel A of this table reports summary statistics for bond-level and issue-level control variables used to estimate secondary market trading costs in Panel B of Table 5, but which were unreported in the main table. Similarly, Panel B reports the coefficient estimates for these control variables corresponding to the regressions in Panel B of Table 5. Heteroscedasticity robust standard errors are double clustered on deal and day of trade and are reported in parentheses.

Panel A: Summary Statistics

	(1) N	(2) Mean	(3) SD	(4) Median	(5) Min	(6) Max
Bond-level						
Bond Amount (/1000000)	116905	9.29	12.56	3.59	0.05	45.00
Bond Maturity	116905	17.02	8.75	17.00	0.50	30.50
Issue-level						
Callable	116905	0.98	0.14	1	0	1
Insured	116905	0.46	0.50	0	0	1
AAA-rated	116905	0.38	0.49	0	0	1
AA-rated	116905	0.27	0.44	0	0	1
Below AA	116905	0.18	0.38	0	0	1
Unrated	116905	0.17	0.38	0	0	1
Competitive Bid	116905	0.08	0.27	0	0	1
Sinking Fund	116905	0.80	0.40	1	0	1
Revenue Bond	116905	0.97	0.16	1	0	1
# of Underwriter Deals	116905	133.47	123.59	103.00	1.00	675.00
# of Underwriters	116905	2.48	2.19	2	1	15
Students (/1000)	116905	11.60	10.21	8.44	0.45	44.20
Public	116905	0.53	0.50	1	0	1
Giving Per Student (/1000)	85719	5.06	6.95	2.28	0.11	30.46
HBCU	116905	0.02	0.12	0	0	1

Table A5. Analysis of Newly Issued Bonds (Unreported Results, Continued).

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

	(1) Markup	(2) Offering Price	(3) Sale Price
Days Since Offering	9.08	-0.09	-0.01
	(1.05)	(0.02)	(0.01)
Log(Trade Size)	-31.59	0.60	0.29
	(1.96)	(0.05)	(0.04)
Log(Bond Amount)	11.83	-0.05	0.07
	(3.96)	(0.10)	(0.10)
Log(Bond Maturity)	48.56	-1.33	-0.86
	(4.31)	(0.14)	(0.14)
Callable	41.11	-2.06	-1.62
	(30.49)	(0.84)	(0.73)
Insured	3.92	-0.65	-0.61
	(22.31)	(0.45)	(0.43)
Competitive Bid	-58.43	-0.22	-0.79
	(44.45)	(0.58)	(0.53)
Sinking Fund	-7.24	-0.23	-0.30
	(13.46)	(0.33)	(0.28)
Revenue Bond	-9.11	-0.47	-0.57
	(37.53)	(0.99)	(1.07)
Log(Students)	-6.39	0.24	0.18
	(11.51)	(0.20)	(0.20)
Public	12.88	-0.33	-0.21
	(24.32)	(0.47)	(0.43)
Log(# of Underwriter Deals)	-4.15	0.27	0.23
	(9.43)	(0.27)	(0.25)
Log(# of Underwriters)	-4.12	0.11	0.07
	(13.67)	(0.29)	(0.26)
Giving Rate Tercile (L)	7.78	-0.05	0.03
	(23.93)	(0.31)	(0.28)
Giving Rate Tercile (M)	12.05	0.15	0.27
	(20.27)	(0.40)	(0.38)
Giving Rate Tercile (H)	-4.65	-0.02	-0.06
	(23.59)	(0.44)	(0.45)
Constant	330.83	97.67	100.86
	(122.48)	(2.53)	(2.44)

Table A6. Analysis Of Seasoned Trades (Unreported Results).

Panel A of this table reports summary statistics for bond-level and issue-level control variables used to estimate secondary market trading costs in Panel B of Table 6, but which were unreported in the main table. Similarly, Panel B and Panel C report the coefficient estimates for these control variables corresponding to the regressions in Panel B and Panel C of Table 6. Heteroscedasticity robust standard errors are double clustered on deal and day of trade and are reported in parentheses.

Panel A: Summary Statistics

	(1) N	(2) Mean	(3) SD	(4) Median	(5) Min	(6) Max
Bond-level						
Bond Amount (/1000000)	378079	14.74	15.64	7.60	0.05	45.00
Bond Maturity	378079	20.96	8.47	21.50	0.50	30.50
Issue-level						
Callable	378079	0.97	0.18	1	0	1
Insured	378079	0.64	0.48	1	0	1
AAA-rated	378079	0.61	0.49	1	0	1
AA-rated	378079	0.18	0.39	0	0	1
Below AA	378079	0.09	0.29	0	0	1
Unrated	378079	0.11	0.32	0	0	1
Competitive Bid	378079	0.07	0.26	0	0	1
Sinking Fund	378079	0.78	0.42	1	0	1
Revenue Bond	378079	0.97	0.17	1	0	1
# of Underwriter Deals	378079	124.26	105.36	95	1	675
# of Underwriters	378079	2.61	2.18	2	1	17
Students (/1000)	378079	11.92	9.93	9.59	0.45	44.20
Public	378079	0.44	0.50	0	0	1
Giving Per Student (/1000)	298433	5.92	7.17	2.75	0.11	30.46
HBCU	378079	0.03	0.16	0	0	1

Table A6. Analysis Of Seasoned Trades (Unreported Results, Continued).

Panel B: Transaction Costs

Sample:	(1) All ΔPrice	(2) All ΔPrice	(3) All ΔPrice	(4) $< \$25,000$ ΔPrice	(5) $\$25K - 100K$ ΔPrice	(6) $\geq \$100K$ ΔPrice
Log(Trade Size)			0.02	0.10	0.02	-0.01
			(0.00)	(0.01)	(0.01)	(0.01)
Log(Bond Amount)			-0.01	-0.02	0.01	0.04
			(0.01)	(0.01)	(0.01)	(0.02)
Log(Bond Maturity)			-0.03	0.07	-0.09	-0.17
			(0.01)	(0.01)	(0.02)	(0.02)
Callable			-0.05	-0.09	-0.03	-0.03
			(0.03)	(0.04)	(0.04)	(0.04)
Insured			-0.01	-0.01	-0.02	0.04
			(0.01)	(0.01)	(0.02)	(0.04)
Competitive Bid			-0.02	-0.02	-0.03	-0.09
			(0.01)	(0.02)	(0.03)	(0.05)
Sinking Fund			-0.02	-0.00	-0.03	-0.11
			(0.01)	(0.01)	(0.02)	(0.03)
Revenue Bond			-0.01	-0.02	0.06	-0.05
			(0.02)	(0.02)	(0.04)	(0.06)
Log(Students)			0.01	0.01	0.01	0.04
			(0.00)	(0.01)	(0.01)	(0.02)
Log(# of Underwriter Deals)			0.00	0.02	-0.01	-0.06
			(0.00)	(0.01)	(0.01)	(0.02)
Log(# of Underwriters)			-0.01	-0.03	0.02	0.03
			(0.01)	(0.01)	(0.01)	(0.03)
Public			0.00	0.01	-0.01	-0.05
			(0.01)	(0.01)	(0.02)	(0.05)
Giving Rate Tercile (L)			0.01	0.02	-0.00	-0.04
			(0.01)	(0.01)	(0.02)	(0.05)
Giving Rate Tercile (M)			0.01	-0.00	0.02	0.10
			(0.01)	(0.01)	(0.02)	(0.04)
Giving Rate Tercile (H)			0.02	0.02	0.02	0.09
			(0.01)	(0.01)	(0.02)	(0.05)

Table A6. Analysis Of Seasoned Trades (Unreported Results, 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
Log(Trade Size)		-0.14		-0.11		0.36
		(0.01)		(0.01)		(0.04)
Log(Bond Amount)		-0.04		0.03		-1.03
		(0.02)		(0.02)		(0.05)
Log(Bond Maturity)		0.72		0.75		0.35
		(0.03)		(0.03)		(0.09)
Callable		0.08		0.06		0.38
		(0.07)		(0.09)		(0.37)
Insured		-0.18		-0.13		-0.43
		(0.07)		(0.06)		(0.18)
Competitive Bid		-0.01		-0.09		-0.54
		(0.06)		(0.06)		(0.19)
Sinking Fund		0.14		0.15		0.09
		(0.04)		(0.04)		(0.14)
Revenue Bond		-0.06		-0.07		0.52
		(0.10)		(0.08)		(0.25)
Log(Students)		-0.06		-0.05		-0.26
		(0.03)		(0.03)		(0.08)
Log(# of Underwriter Deals)		0.07		0.16		0.19
		(0.02)		(0.02)		(0.07)
Log(# of Underwriters)		-0.06		-0.20		-0.10
		(0.04)		(0.04)		(0.10)
Public		0.03		0.02		0.15
		(0.07)		(0.06)		(0.18)
Giving Rate Tercile (L)		0.02		0.00		-0.11
		(0.06)		(0.05)		(0.15)
Giving Rate Tercile (M)		-0.18		-0.19		-0.25
		(0.06)		(0.06)		(0.16)
Giving Rate Tercile (H)		-0.31		-0.31		-0.52
		(0.07)		(0.07)		(0.19)
Constant	4.27		4.20		4.20	
	(0.03)		(0.03)		(0.07)	