

The Role of Debt in Financing Higher Education

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Abstract

This paper examines the use of debt, leverage levels, and cost of debt for U.S. four-year public and private non-profit universities. Universities have become increasingly reliant on debt with issuance amounts increasing from \$3 billion in 1985 to more than \$50 billion in 2019. We find that public universities have a lower cost of debt than private universities by about 25 basis points. Consistent with this reduced cost of debt, we document a 50 percent increase in leverage for public universities while private universities have experienced a 25 percent decrease in leverage over the last 20 years. We find a one percent increase in the excess issuance cost over the risk-free rate following the decline of the municipal insurance market. We document large increases in the use of taxable debt over time due to the more flexible nature of its use. Lastly, we document the increasing use of debt by U.S. universities has contributed to the increasing cost of higher education. Debt issuances result in no detectable increases in educational quality but are instead directed towards increasing the quality of university amenities. In summary, our results provide context for the increasing use of debt by higher education and its implications for students and other stakeholders.

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In 2020, U.S. four-year public and private not-for-profit universities had more than \$265 billion in long-term debt outstanding alone. While much media and academic attention has been focused on the student-loan crisis (Mueller & Yannelis, 2022; Mueller & Yannelis, 2019) from the student perspective, considerably less work has addressed the feedback effects stemming from the uptake of debt by universities themselves. For example, in 2020, the average university paid approximately \$1,000 per student per year in interest expenses, whereas the average in-state tuition for in-state students at public universities was \$10,000 per year.

The optimal use of debt financing is particularly important for universities in their role to facilitate the development of human capital. They have a unique governance structure as nonprofits, with no ability to issue equity in themselves and lack an explicit residual claimant. Underinvestment by universities implies an inefficient supply of human capital development, while overinvestment in debt has perverse impacts on the uptake of human capital, overburdening students with debt. This leads to an inefficient allocation of human capital (Chakrabarti et al., 2023; Hampole, 2022).

In this paper, we examine universities' debt issuances, the cost of debt, leverage, and use of debt across U.S. four-year public and private not-for-profit universities. We provide descriptive trends and institutional details to aid the practitioner's understanding of the intersection of debt and higher education *across* time, and also examine more fine-grained variation *within* time, location, and bond features to understand the behavior of universities and impact of external factors like state support. Our main empirical analysis focuses on three main results connected to the cost of debt *across* universities, changes in leverage *within* a university over time, and changes following increasing leverage *within* a university. To the

extent that universities might use alternative sources of explicit leverage (e.g. bank debt) or implicit leverage through public-private partnerships (P3s), our results provide a lower bound of the true use of leverage by universities.¹

Descriptively, we show that university issuances have increased from about \$3 billion in 1985 to a peak of nearly \$60 billion in 2019.² Historically, almost all issuances were tax-exempt, but there has been a notable increase in taxable debt, especially following the Great Recession. Overall, leverage levels for public universities have increased since 2001, coinciding with a decline in state support, but private universities have experienced a decline in leverage. We document that the excess return of university issuances in excess of the risk-free rate have increased by about one percent following the breakdown of the municipal bond insurance market from the Great Recession.

First, we document that public universities have a lower cost of debt issuances than their private university counterpart. Descriptively this gap is about 45 basis points and this gap remains statistically and economically significant as we include bond controls, university controls, and tighter fixed effects, declining to about 18 basis points. For the average public university issuer, we estimate a savings of about \$2.8 million in interest expense payments over the lifetime of a bond relative to a comparable private university issuer. We find that underlying state economic conditions explain variation in a university's issuance yield which provides some evidence the presence of an implicit governmental stakeholder for public universities (the state government) might make their debt less risky than an equivalent

¹For context, between 1997 to 2015, higher education P3s were completed in 35 states with about \$13 billion in total bond issuances issued by the P3 entities (P3 Resource Center, 2018). See <https://p3resourcecenter.com/wp-content/uploads/2018/07/A-Guide-to-Higher-Ed-Public-Private-Partnerships.pdf> for more information on the history and growth of P3s.

²In recent years, four-year universities accounted for six percent of total municipal issuances (Lord Abbett, 2024).

private university.

Second, we find that changes in governmental support explain variation in leverage for primarily public universities. Public universities are more heavily reliant on state support than their private university counterparts (40 percent versus 5 percent as a proportion of total revenue) which leads to public universities to be vulnerable to declines in state funding stemming from state-level operating crises. We find that public universities experience statistically significant increases in its future leverage following contemporaneous drops in state support as universities attempt to smooth operating crises or attract new students. These declines in state support were particularly sizeable from 2008 to 2012 as state governments cut funding to public universities in the aftermath of the Great Recession.

Third, we examine the effects of these increases in leverage, and we find that increases in cost are driven by university spending on quality expenses which consists of student services and auxiliary expenses. We find no detectable increase in academic expenses or the quality of education as most issuance proceeds appear to be invested in physical infrastructure serviced directly by student revenues such as dormitories. These increases in leverage are linked to subsequent increases in tuition for only in-state students which reflects their more inelastic demand in comparison to out-of-state students. To further strengthen inference of this result, we show these increases in leverage are not necessary to accommodate more students. We find a null result for increases in total enrollment which supports the fact that debt issuances are undertaken to attract more out-of-state students who are more profitable for institutions.

Our findings have several implications. First, the increasing use of taxable debt by universities due to its increasing flexibility in its uses cases suggests that a closer regulatory examination of tax-exemption use cases would be beneficial. The modern university has

increasingly shifted away from tax-exempt debt due its limited use cases that restrict for-profit industry collaborations, advanced refinancing, and the smoothing of operating crises while some of these use cases seem in alignment to helping the modern university serve its stakeholders. Second, the breakdown of the municipal bond insurance market following the Great Recession has led to increases in the average issuance yield net of the risk-free rate by about one percent as many insurers permanently left this market. In light of the dependence of universities on this market and the large proportion of segmented, retail investors, our results provide motivation for further study of this market to assure that universities have access to the capital they need at reasonable costs. Third, the impact of declining state support on public university debt suggests the importance of state governments to provide more consistent funding to their in-state universities to assure certain student cohorts do not disproportionately share the burden of budget declines.

Related Literature. Our paper contributes to the literature on the impact of state support on increasing student loan debt borne by students (Chakrabarti et al., 2023; Chakrabarti, Gorton, & Lovenheim, 2020). Similar to the prior literature, we document that increasing costs are borne disproportionately by specific student cohorts. However, our results provide additional context for this mechanism by documenting these universities take on additional debt to smooth these operating crises and this cost is borne primarily by *in-state* students rather than *out-of-state* students. Our paper is also broadly related to the literature examining the investment decisions of non-profits, namely hospitals (Adelino, Lewellen, & Sundaram, 2015; Wedig, Hassan, & Sloan, 1989), which have increasingly focused on improving the *appearance* of quality—a more observable aspect—than the *underlying* quality (Goldman & Romley, 2008; Goldman, Vaiana, & Romley, 2010). In the context of the municipal bond

market in higher education, Dougal et al. (2019) find that historically black colleges and universities (HBCUs) pay higher underwriting fees and gross spreads, consistent with racial discrimination.

Our main empirical result is most closely connected to Jacob, McCall, and Stange (2018) which finds that students value consumption amenities using data on the enrollment decisions of U.S. students. Similar to Jacob, McCall, and Stange (2018), we document that universities have increased expenditures on amenity-related expenses and contribute an understanding these expenditures stem from municipal bond issuances rather than endowment spending or gifts. Related to the capital structure decision of universities, Rosen and Sappington (2016) examine the leverage decision of universities as a function of cash flow uncertainty and find evidence supporting the pecking order theory of capital structure in which firms use internal financing before issuing debt or equity (Myers & Majluf, 1984). Our paper contributes to this literature by examining specific cash-flow determinants of university leverage and heterogeneous differences in the cost of debt for U.S. *public* and *private* four-year universities.

1 Institutional Details

Higher education institutions, including both 4-year public and private colleges, frequently turn to the municipal market to fund a variety of projects. These projects range from constructing new research facilities to building campus dormitories and parking garages for students and staff. Given that nonprofit organizations like colleges and universities lack shareholders and cannot issue equity, municipal debt serves as a significant source of external financing for them.

Taxable versus Tax-Exempt Bonds: Historically, U.S. colleges have heavily relied on tax-exempt municipal debt issuances. This type of debt provides tax-exempt interest for all investors at the federal level and typically at the state level for in-state investors. Public colleges often issue tax-exempt bonds directly. However, in some cases, state law restricts this, prompting government entities or the state itself to issue bonds on behalf of the university (e.g., State of Wisconsin). Conversely, private universities typically utilize conduit issuers, such as state or local governmental entities or nonprofit organizations, to issue tax-exempt debt. These conduit issuers offer a pathway for universities to access the tax-exempt bond market. For instance, Harvard University might have revenue bonds issued by the Massachusetts Development Finance Agency.³ In addition to tax-exempt debt, higher education institutions might opt for taxable debt. These bonds might be issued for projects or activities that do not qualify for tax-exempt status under federal tax laws and offer university issuers greater flexibility in the use of proceeds. For example, if bond proceeds are used for a project generating unrelated business income, the interest on those bonds might become taxable. Universities might also issue taxable debt to partner with a for-profit corporation or to refinance a bond as advanced refunding requires issuing taxable debt following the Tax Cuts and Jobs Act of 2017. The yield-to-maturity on tax-exempt bonds is typically lower than that of taxable debt, as investors do not pay taxes on interest income of tax-exempt issuances. Ultimately, the decision to issue taxable or tax-exempt bonds hinges on factors like the nature of the project, investor demand, and tax considerations.

Security Features: Municipal debt issued by colleges can take one of two forms: general obligation bonds (GO) and revenue bonds. GO bonds are backed by the full faith, credit,

³See Figure A.1 for a summary of issuer frequency for public and private universities.

and taxing power of the issuing municipality or governmental entity, which in this context refers to the college or university. However, as colleges do not collect tax receipts, they cannot issue GO bonds in their pure form. Nevertheless, some states do issue GO bonds specifically designated for higher education facilities at certain institutions. Most universities, private and public alike, issue revenue bonds. These bonds are issued to fund specific revenue-generating projects or facilities such as dormitories, parking garages, athletic facilities, or student centers. Repayment of revenue bonds is typically supported by the revenue generated by the project being financed. For instance, if a university issues revenue bonds to construct a new dormitory, the bond's repayment would primarily rely on the income generated by the dormitory. Revenue bonds do rely, in general, on various sources of repayment, such as tuition and fees, or revenues from an auxiliary facility (e.g., student rec center).

Credit Ratings: Most higher education issuers and their respective issuances undergo evaluation by credit rating agencies such as Moody's, Fitch, and Standard & Poor's. These agencies provide credit ratings for higher education institutions, including colleges and universities, assessing their capability to fulfill financial obligations. Such evaluations are critical as they impact borrowing costs, access to capital markets, and overall financial flexibility of the organizations. Various factors contribute to determining the credit rating of a higher education institution, encompassing revenue sources (such as tuition, state support, and private gifts), liquidity, existing leverage, enrollment trends, market strength, and reputation. Credit rating agencies utilize a blend of qualitative and quantitative metrics in this evaluation process. For instance, Harvard University holds a AAA rating from S&P, the highest achievable credit rating. In contrast, S&P rates the University of Missouri System at AA+, which stands two notches below the AAA rating. In the case of public

universities, fluctuations in state appropriations and state credit risk often influence credit ratings. Conversely, for private universities which lack that source of financing, credit agencies tend to focus more on factors like revenue concentration and market power in shaping student demand and revenues from tuition.

Credit Enhancement: Credit enhancement techniques are often used by higher education issuers to improve their credit rating and thus lower borrowing costs. The main types of credit enhancement strategies are (1) bond insurance, (2) letters of credit (LOCs), and (3) other guarantees. Bond insurance refers to the purchase of an insurance policy on the bonds and thus a transfer of credit risk from the borrower to the insurer, which would make interest payments if the borrower fails to do so. Bond insurance was fairly common before the 2008 financial crisis but has since declined in usage. Examples of insurers are AGM, formerly known as Financial Security Assurance, and Build America Mutual (BAM). Institutions can secure LOCs from banks or financial institutions, which serve as a guarantee to repay bondholders in case of default. This backing by a financially stable entity enhances the credit quality of the bonds, potentially resulting in lower interest rates. Finally, guarantees can take many forms, but the most common ones are state guarantees using reserve funds (e.g., Colorado Intercept Program).

2 Data and Measurement

Debt Issuances

Our issuance level data consists of municipal bond issuances and U.S. higher education institutions reporting to the Integrated Postsecondary Education Data System (IPEDS). We

begin by downloading all municipal bond issuances from Refinitiv’s SDC Platinum with the main use of proceeds denoted as “Higher Education” paying a fixed coupon rate which returns 18,689 issuances. We then obtain a unique list of municipal bond issuers and beneficiaries of proceeds (in cases where conduit authorities issue debt on behalf of higher education institutions), and hand-match these with the universe of IPEDS reporting organizations. We match by a bond’s beneficiary which returns 9,766 linked issuances and then by a bond’s issuer which results in 15,353 linked issuances. Restricting our sample to bond issuances from academic years 1985 to 2022 by U.S. four-year public and non-profit universities with non-missing yield and other key bond features leaves us with 9,473 bond issuances used in our issuance analysis.⁴ In some of our robustness tests, we adjust bond yields to account for differences in marginal tax rates at the federal and state level. Following Schwert (2017), we compute tax-equivalent yields as:

$$y_{i,t}^{\text{taxable}} = \frac{y_{i,t}^{\text{tax-exempt}}}{(1 - \tau_t^{\text{fed}}) \times (1 - \tau_{s,t}^{\text{state}})} \quad (1)$$

University Financial and Operating Data

Our data on the financial position and operations of U.S. four-year public and private not-for-profit universities comes from IPEDS, which began collecting data on U.S. higher education institutions annually from 1985 to 2022.⁵ We merge this data, which includes relevant university controls from 1985 to 2022, into our issuance panel. This panel consists of universities *conditional* on having a debt issuance in a given year. Additionally, we construct

⁴The main sample attrition is due to restricting our sample analysis to four-year public and non-profit universities.

⁵We thank Urban Institute for providing direct access to this data.

a university-year panel data that covers all university- year observations *regardless* of their debt issuance decision to examine changes in leverage within a university over time and how proceeds are used. Due to many balance sheet measures being recorded starting in 2001 to IPEDS, we restrict our analysis in this setting to data from 2001 to 2022.

State Economic Conditions and Credit Rating Data

We also bring in state economic condition data to understand how a university's home state affects a university's debt issuance behavior. We obtain state economic data from the Philadelphia Federal Reserve Bank based on its coincident index (a measure of economic activity) and unemployment rates. Additionally, to control for underlying state distress risk, we obtain data from S&P global on ratings changes at the state level.⁶

2.1 Summary Statistics

Table 1 provides a breakdown of summary statistics across our bond issuance sample. Panel A shows that the average issuance yield of university bonds is 4.67 percent. However, the data masks a significant degree of variation. While the median issuance yield-to-maturity is 4.70 percent, yields can range from as low as 1.25 percent to as high as 8.30 percent. This suggests that some universities issue debt with lower yields due to better underlying fundamentals (e.g., cross-sectional variation) or more advantageous timing during periods of lower aggregate yields. When we adjust tax-exempt yields using Equation 1, the average tax-adjusted rate is comparable to a taxable bond offering a 6.08 percent yield. The average bond has a maturity of nearly 22 years and a composite issue amount of \$67.22 million,

⁶We obtain this data from <https://www.spglobal.com/ratings/en/research/articles/190319-history-of-u-s-state-ratings-2185306>.

indicating these bond issuances are economically large. About 88 percent of bonds are taxable while 39 percent of university issuers are unrated, implying that their debt might carry a large risk premium without the use of insurance or credit enhancement.

Figure 1 shows that there has been significant growth in the use of debt by universities since 1985. In 1985, debt issuance amounts across all universities totaled about \$3 billion which have increased to over \$50 billion in 2019. These issuances have steadily increased with Panel A showing that much of these debt issuances are carried by public universities. Panel B documents an increasing use of taxable debt in recent years which spiked following the Great Recession of 2008 and around the onset of Covid-19 in 2020. The spike in taxable debt following the Great Recession was partially driven by the Build America Bonds which offered subsidized borrowing costs for taxable debt and expired in 2010.⁷ Figure A.2 provides evidence the more recent increase in taxable debt appears to be driven by tightening margins for U.S. universities, especially for public universities, while the low interest rate environment has also contributed.

Panel B of Table 1 provides a breakdown of the characteristics of the average university issuer. On average, these university issuers are part of large, growing institutions rather than small, financially distressed universities. About 62 percent of university issuers are public universities and more than 40 percent are R1 doctoral designated schools. The average university issuer has nearly 17,000 students and has an admittance rate of 66 percent. Panel C of Table 1 shows that the average university has assets of \$1.86 billion with its endowment about 30 percent of its asset base. Long-term debt is also a significant factor in these universities as it comprises 25 percent of a firm's asset base while total liabilities are 40

⁷See <https://www.brookings.edu/articles/why-the-surge-in-taxable-municipal-bonds/>.

percent. Figure 2 shows the change in time-varying leverage for universities over time from 2001 to 2022. Public universities have experienced increases in leverage defined either as *Liabilities/Assets* or *Long-term Debt/Assets* while the leverage of private universities has actually declined. For public universities this increase in leverage is observed primarily until 2013 before gradually declining. The increase in *Liabilities/Assets* for public universities in 2014 reflects net pension liabilities shifting onto the balance sheet for public universities.⁸

While the large increases in annual issuance amounts shown in Panel A of Figure 1 and small changes in leverage in Panel B of Figure 2 appear to be in contrast, much of these issuances result in no changes in university leverage as they stem from a university refinancing previously issued debt. Figure 3 plots the proportion of issuances within each academic year and shows an increasing propensity of universities to refinance debt during declining interest rate environments. The risk-free rate has declined from close to 9 percent in 1985 to nearly 0 percent in 2020 which coincided with an increase in issuances for the purpose of refinancing from about 30 percent in the late 1980s to around 60 percent in the late 2010s.

Table 2 displays summary statistics across university issuer types to better understand variation in the cost of debt, use of debt, and financial structure across universities. Panel A of Table 2 shows that across issuer types, public universities have the lowest issuance yields of 4.50 percent which is about 50 basis points less than private universities. It is possible that this descriptive difference exists simply as a result of public universities being more likely to issue insured debt or to modify other debt features to lower their cost of debt, so we return to this pattern in our empirical analysis. We find that historically black colleges and

⁸See <https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2016/08/the-state-pension-funding-gap-2014> for more information.

universities (HBCUs) have the highest gross spread or fee charged by the underwriter to sell the debt issuance which is consistent with Dougal et al. (2019).

Universities with hospitals have the largest issuance sizes with an average amount of nearly \$150 million reflecting the large investment necessary to maintain and grow healthcare infrastructure. We find that public universities are the most likely to purchase insurance and do so 31 percent of the time while R1 doctoral universities have the highest underlying issuer rating. Panel B of Table 2 shows the leverage ratio of *Liabilities/Assets* or *Long-term Debt/Assets* is much smoother across university types than the scaled endowment base of *Endowment/Assets* as private universities have nearly double the proportion of scaled endowment assets than public universities (0.40 vs. 0.23).

Panel C of Table 2 documents significant heterogeneity in the revenue sources across university types. Public universities rely primarily on state support (40 percent), net tuition revenue (20 percent), and other auxiliary revenue sources (19 percent). In contrast, the average private university has almost no reliance on state support (5 percent) while instead relying on net tuition revenue (32 percent), financial revenue (23 percent), and other revenue (18 percent).^{9,10} Additionally, private universities have the largest revenue concentration based on the Herfindahl-Hirschman Index (HHI), while R1-doctoral universities have the most diversified revenue sources.

Figure 4 displays the time-varying average yields across private and public issuers over time. Overall, this descriptive difference in yields across private and public university issuers is quite stable over time with this gap of about 45 basis points based on the issue yield.

⁹Figure A.3 shows the full unconditional breakdown of revenues and expenses across public and private universities.

¹⁰Figure A.4 and Figure A.5 show the time-varying composition of revenues and expenses by university type, respectively.

The figure also shows a secular increase in the excess issuance net the risk-free rate which was below zero for the period preceding 2008 but has risen to about one percent afterwards. To understand this gap, Panel A of Figure 5 shows the underlying ratings of the issuing universities over time. After 2000, an increasing number of universities have transitioned from being unrated with the largest increase occurring within the *Below AA Rated* and *AA Rated* groups, but there has also been an increase in *AAA Rated* issuers. Although the change in underlying ratings does not explain this increase in risk premium, Panel B of Figure 5 examines whether the underlying rating of the bond itself has changed. The change in bond rating decomposition is quite striking as post-2008, the proportion of *AAA* rated debt issuances has declined from about 50 percent to less than 10 percent. These patterns reflect the breakdown of the municipal bond insurance market in the aftermath of the Great Recession and Figure A.6 shows this decline in *AAA* rated debt is almost perfectly matched by the decline of bonds with insurance.

2.2 Empirical Methodology

2.2.1 Empirical Methodology: Bond Features

To examine how college and university demographic and financial characteristics affect bond issuance features, we estimate the following empirical specification:

$$Y_{i,s,t} = \beta_1 \text{Public}_i + \beta_2 \text{School Controls}_{i,t} + \beta_3 \text{Bond Controls}_{i,t} + \lambda_{s,t} + \varepsilon_{i,s,t} \quad (2)$$

where $Y_{i,s,t}$ denotes a bond feature such as the underlying rating, the presence of bond insurance, or the yield to maturity for school i in state s at time t . One of the main coefficients

of interest is β_1 which represent the incremental effect of a public versus a private college on a particular bond feature (e.g., yields). *School Controls* is a vector of financial and demographic features such as revenue concentration, the natural logarithm of total revenue, the natural logarithm of total enrollment, time-average SAT scores, leverage ratios, and the natural logarithm of endowment size. *Bond Controls* include the natural logarithm of bond maturity, the natural logarithm of bond amount, credit ratings, whether the bond is insured, whether the bond is tax-exempt, whether the bond has a sinking fund provision, whether the bond is callable, and whether the bond is refunding exist debt. $\lambda_{s,t}$ denotes state-by-year fixed effects, which controls for time-varying unobservable characteristics within a state in a given year, such as shocks to the regulatory environment or local economic conditions. In related tests, we also additively include state and year fixed effects to provide inference of the spillovers of underlying, time-varying characteristics of a state’s economic conditions (e.g., unemployment rate or credit rate) on a university issuer’s bond features. Standard errors are double-clustered at the state and year level.

2.2.2 Empirical Methodology: Leverage Levels and Use of Debt

To examine the leverage levels of universities and the impact of debt on *future* university characteristics we estimate variations of the following empirical specification:

$$Y_{i,s,t+1} = \beta_1 \text{University Characteristic}_{i,t} + \beta_2 \text{School Controls}_{i,t} + \delta_i + \lambda_{s,t} + \varepsilon_{i,s,t+1} \quad (3)$$

where $Y_{i,s,t+1}$ denotes the leverage level of interest or university characteristic for school i in state s at time $t + 1$. School controls is a vector of financial and demographic features

such as the natural logarithm of total revenue, the natural logarithm of total enrollment, and a university’s net income margin. δ_i denotes university fixed effects which controls for time-invariant characteristics of a given university such as its prestige. $\lambda_{s,t}$ denotes state-by-year fixed effects, which controls for time-varying unobservable characteristics within a state in a given year, such as shocks to the regulatory environment or local economic conditions. Standard errors are double-clustered at the state and year level.

3 Main Results

While many of the patterns we have documented reflect secular trends of universities over time (e.g., increasing issuances, tax-exempt issuances, excess issuance yields over the risk-free rate), we proceed to examine variation either within a given year, a given state \times year, or a given state \times year \times bond rating to gain a better understanding across universities’ bond features, leverage levels, and the ultimate use of these proceeds.

3.1 Determinants of Bond Characteristics

Table 3 examines variation in the bond features themselves. The results in column (1) shows that public universities have similar underlying university credit ratings to private universities, while declines in the 30-year risk-free rate at the time of issuance (within a given year) are associated with an issuer having a higher credit rating. We also find that universities comprised of students with higher SAT scores and with larger size (proxied for by total revenues) have higher credit ratings, while increases in revenue concentration are associated with a school having a lower credit rating. Related to the use of the proceeds, the results in

column (2) show that public universities are seven percent less likely than private universities to refinance their debt. The decision to refinance is strongly connected to a university's prestige and underlying rating while variation in the risk-free rate *within* a given year is also informative. The results in column (3) show that public universities are significantly more likely to issue insured debt in comparison to private universities and comprise a majority of insured debt issuances (18 percent higher relative to the sample average of 27 percent). We find idiosyncratic variation in relationship to size and prestige in the take-up of bond insurance as we find that schools with higher ability students and larger enrollments are more likely to purchase insurance while schools with larger revenues and higher credit ratings are less likely to purchase insurance at issuance.

State economic conditions are also an important driver for bond issuance decisions. The results in column (4) show that an improvement in state economic activity is associated with larger bond issuances, while improvements in a university's home state's credit rating have opposite effects as they are associated with smaller issuances. Overall, columns (4) and (5) which examine a university's choice of issuance amount find significant evidence for larger universities with higher credit ratings issuing larger bonds. Examining the choice of a bond's maturity, we find that increases in a state's unemployment rating are linked to shorter maturity bond issuances and improvements in a state's credit rating are also connected to shorter maturity issuances. Across the choice of maturity in columns (6) and (7) we find no evidence of differences in maturities across issuances by public and private universities, while improvements in a university issuer's underlying size or credit rating are associated with longer-dated maturity bonds.

3.2 Determinants of Bond Yields

In Table 4 we examine how university characteristics affect its issuance yield, as the cost of debt for universities is a significant determinant of their level of investment. The results in column (1) show that public universities have an estimated lower cost of debt of about 35 basis points, which is slightly less than the descriptive mean difference of 46 basis points. Column (1) also estimates the impact of the underlying state on a university's issuing yield and finds significant spillovers as improvements in state economic activity and decreases in a state's unemployment rate reduce issuance yields.¹¹

The results in column (2) and (3) show that this gap in yields is partially attributable to differences in bond features across university issuer types as the estimated yield for public universities falls in magnitude to about 18 basis points following the inclusion of rating, maturity, issuance amount, and other bond controls along with the inclusion of year \times state fixed effects. However, this estimated gap in yields remains both highly statistically significant and economically significant as the average public issuer would save about \$2.8 million in interest expense payments over the lifetime of the bond.¹²

The results in column (4) show that this difference in yields across public and private issuers is not driven by differences in an ability to account for a bond's tax status. With the inclusion of an interaction between a university's public status and a bond issuance's tax-exempt status (Public \times Tax-Exempt), we are able to directly compare public and private

¹¹We provide evidence of the spillover from a university's home state to its underlying issuances as the university is uniquely constrained to its home state's economic activity that is unique from other businesses. We do not formally disentangle the impact of state economic activity on issuance yields between the supply of credit (reductions in a state's economic activity lead to crowding out due to an increased supply of municipal debt) versus the demand for credit (reductions in credit lead to a reduced demand for tax-exempt bond issuances due to less taxable income to shield).

¹²This saving in interest payments is computed as 18 basis points \times \$76.09 million (mean issue amount for university issuers) \times 20.47 years \approx \$2.8 million.

issuances *within* the same tax status. The main effect of *Public* now represents the gap in yields between public and private university tax-exempt bonds which is estimated to be 15 basis points lower for public universities while the coefficient on $\text{Public} \times \text{Tax-Exempt}$ of -0.30 estimates that the gap between public and private taxable issuances is 30 basis points lower for an estimated gap of 45 basis points in taxable bonds (15 basis points lower less 30 basis points lower = 45 basis points lower).

The results in columns (5) and (6) show that public universities continue to have a lower cost of debt at issuance than private universities, even when accounting for the quality of a university's students, its revenue concentration, and leverage. In column (7) we tighten our comparison group by comparing bonds issued within the same state, within the same year, and at the same rating level. We continue to find that public universities have a lower cost of debt with an estimated difference in yields of 16 basis points and also find evidence that this model is better accounting for differences in characteristics *across* issuers as *Long-Term Debt/Assets* now has a positive estimated effect on issuance yields which aligns with prior capital structure theory proposing increases in borrowing costs as default risk increases (Modigliani & Miller, 1958). Lastly, in column (8) we use an even tighter unit of identification by comparing bonds issued by universities within the same county, within the same year, within the same rating grouping, we continue to find that public universities have a lower estimated cost of debt than private universities.

3.3 Variation in University Financial Leverage

In Table 5, we proceed forward to examining variation in the level of a university's leverage over time *within* the same university. In column (1) we examine a university's future leverage ($Long-Term\ Debt/Assets_{t+1}$) on its composition of revenue sources. We find that declines in governmental revenue support result in increases in a university's future leverage. In column (2) we separate total governmental revenue into its components of state and federal government revenue, and we find that only changes in a university's federal governmental revenue support are statistically significant in explaining variation in a university's subsequent leverage levels. To understand the heterogeneous impact of state and federal revenue support across university type, in column (3) we interact these revenue components with a university's public status. We find that declines in state support are informative in explaining variation in a university's subsequent leverage, but only for public universities with declines in state support leading to increases in future leverage. In contrast, shifts in federal revenue support have no difference in their impact *across* public and private universities, with both experiencing increases in leverage in response to declines in federal government support.

As many universities might rely on other liability sources to respond to changes in their revenue concentration, we also examine shifts on a university's leverage, defined more broadly as $Liabilities/Assets_{t+1}$ in columns (4) to (6) of Table 5. The results in column (4) shows that declines in total governmental revenue are largely informative of a university's subsequent leverage, with an estimated effect size relative to the mean about two times that of the comparable estimate in column (1). Surprisingly, the decomposition of total governmental revenue into state and federal governmental revenue results in two statistically insignificant

effects despite both coefficients being larger in magnitude than the overall effect estimated in column (4). Lastly, in column (6) we interact these components of governmental revenue on a university's public status. Similar to the results in columns (1) to (3) a decline in state revenue precedes large increases in its leverage, but only for public universities, as private universities actually have increases in leverage in response to universities receiving additional state support. In regards to changes in federal revenue, we find that declines in the proportion of federal revenue precede increases in $Liabilities/Assets_{t+1}$ for only public universities but have no impact for private universities.

3.4 The Effects of Debt on Higher Education

Up to this point, we have shown that declines in state support often precede increased leverage for public universities. These debt issuances might be optimal if they allow universities to smooth operating crises caused by declines in state support to assure that optimal investment is occurring in the development of human capital. In contrast, additional leverage driven by a desire to increase the *appearance* of university educational quality rather than educational quality itself would be less optimal (Goldman & Romley, 2008; Goldman, Vaiana, & Romley, 2010; Jacob, McCall, & Stange, 2018).

In Table 6 we examine changes in university behavior that follow increases in a university's ratio of *Long-Term Debt/Assets_t*. Panel A of Table 6 examines changes in a university's composition of expenses and dormitory capacity following increased leverage. The results in column (1) show that increases in leverage precede increased investment in quality expenses, which include student service expenses and auxiliary expenses. Columns (2) and (3) show

that the ratio of quality expenses to academic expenses and quality expenses per student also increases, providing evidence that most of these debt issuances are targeted towards student related services. The results in column (4) document significant increases in dormitory capacity following these increases in leverage. In summary, these results provide evidence that universities have increasingly used debt as a tool to cater to student demand for increasing amenity quality, with no evidence of spillovers to educational quality.

In Panel B of Table 6 we examine who bears these increasing costs and whether these increases in leverage are driven by a need to increase infrastructure due to increased student enrollment or a shift in the composition of student enrollment. The results in column (1) find that increases in leverage precede increases in the cost of in-state tuition with the inclusion of controls for a university's composition of revenues, endowment, enrollment, and net income margin. These controls provide some assurance this link is not mechanical—e.g., that a state might reduce its state support which results in a need for a university to shift this operating crisis to its students. Column (2) documents no increase in costs for out-of-state students' tuition costs, which might reflect the fact that these students have more elastic demand than in-state students due to having more choices. The null effect of leverage on a university's subsequent enrollment in column (3) suggests that schools are not taking on additional leverage due to the need to expand operations to accommodate a growing student body. In contrast, the results in column (4) shows that the number of out-of-state students increases following leverage increases which suggests that schools take on additional debt to attract out-of-state students which are more profitable to these universities, especially in periods of declining state appropriations.¹³

¹³For example, the University of Alabama's non-resident student base grew from 626 students in 2002 to

4 Conclusion

Colleges and universities have increasingly relied on debt over the last 35 years to meet an increasing demand for higher education. We document large secular increases in the use of taxable debt as universities desire more flexible uses of financing and the breakdown of the municipal bond insurance market which contributed to an increase in excess municipal bond yields. We find significant heterogeneity in leverage and the cost of debt across public and private universities. Public universities have experienced a 50 percent increase in leverage over the last 20 years due to declines in state support while private universities have experienced a 25 percent decrease in leverage. We find that public universities have a lower cost of debt by about 20 basis points which has also contributed to these differences in leverage across public and private universities. Lastly, in regards to the use of these debt issuances, we document that increases in leverage precede increases in quality-related expenses and dormitory expansions. These quality-related issuances result in increases in cost that are born primarily by in-state students while it seems universities more aggressively recruit out-of-state students.

2,406 students in 2018. See <https://www.al.com/news/2019/03/ua-is-extreme-case-of-state-schools-recruiting-out-of-state-residents-report-finds.html>.

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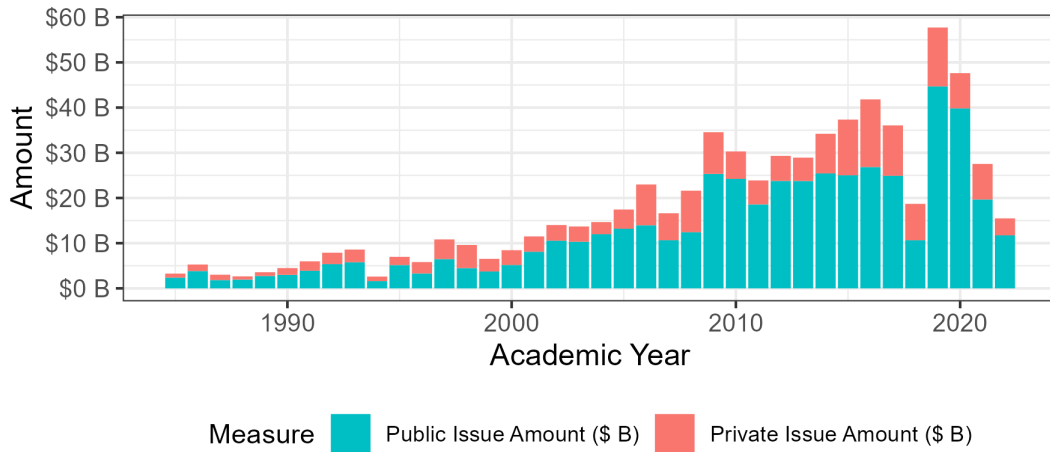
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Figure 1: Issuance and Taxable Amounts

This figure shows the issuance amounts of debt by year across public and private universities in Panel A and taxable versus tax-exempt debt in Panel B.

A



B

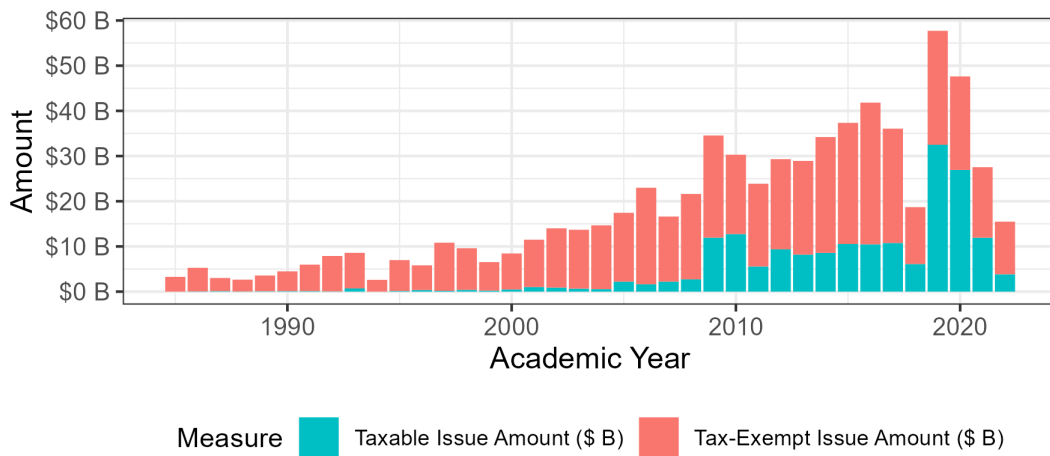


Figure 2: Leverage Measures Across Private and Public Universities

This figure shows measures of leverage across public and private universities in the IPEDS sample. The red lines show the ratio of liabilities scaled by assets for private (solid line) and public (dashed line), and the blue lines show the ratio of long-term debt by assets for private (solid line) and public (dashed line) universities.

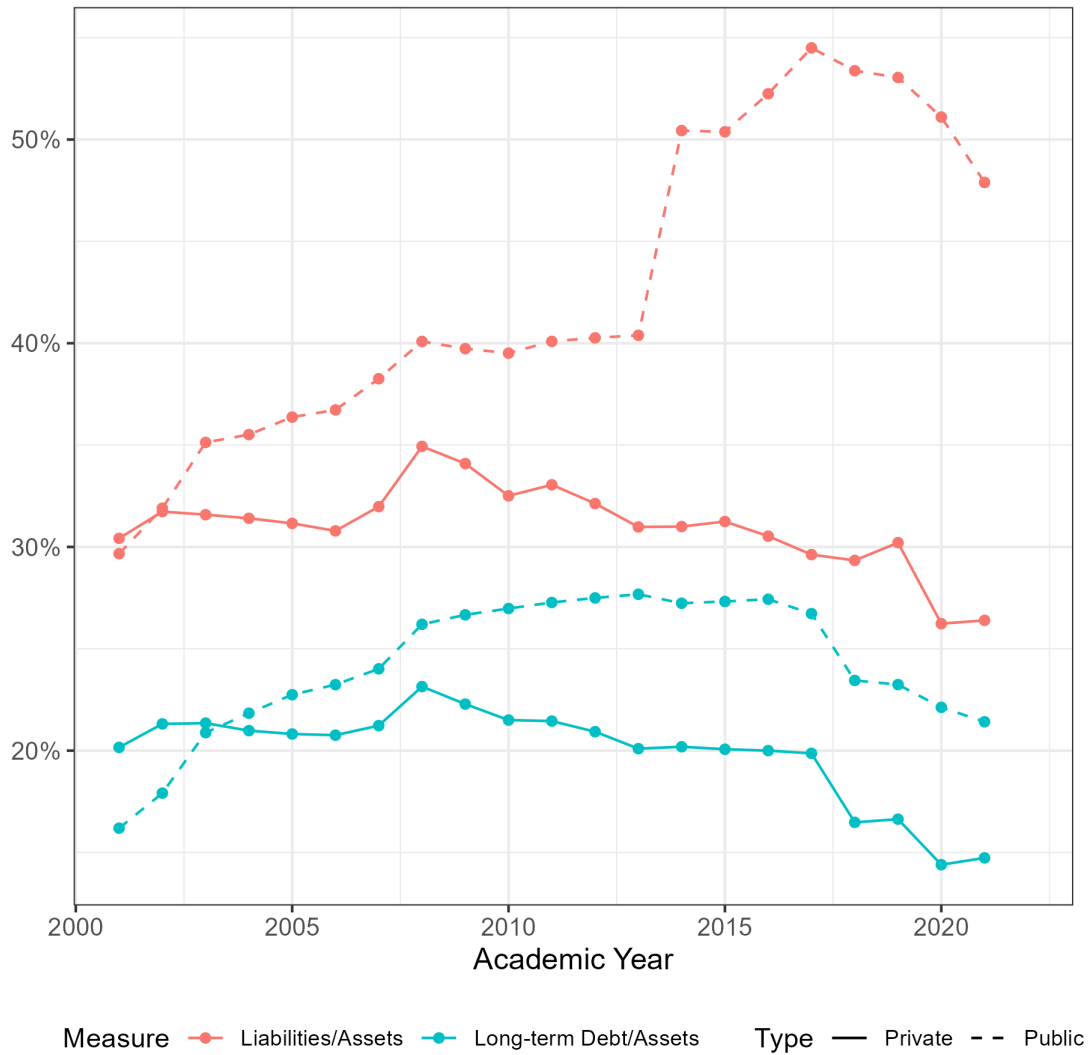


Figure 3: Refinancing and Refunding Issuances Versus Risk-Free Rate

This figure shows the average proportion of debt issuances used to refinance or refund existing issuances within a given academic year versus the risk-free rate of the issuing maturity length.

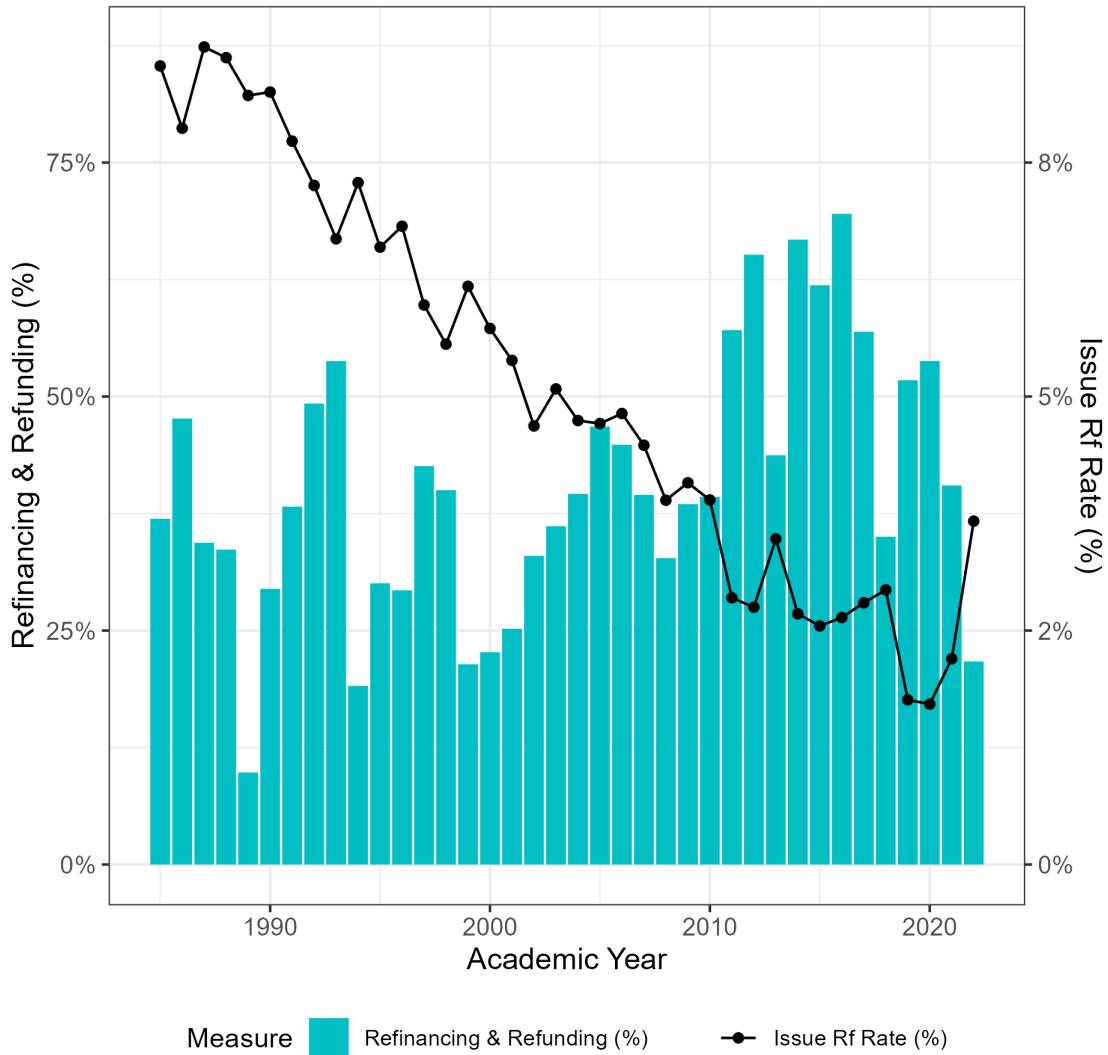


Figure 4: Bond Yield Measures at Issuance

This figure shows the average issuance yields for private and public university issuers over time. *Yield* is the interest rate of the bond at issuance, and *Tax-Adj. Yield* modifies the yield to account for the exemption from federal and state income taxes for an in-state investor. *Tax-Adj. Yield - R_f* nets out the risk-free rate based on the maturity-matched, risk-free rate and *Yield - R_f* nets out the risk-free rate from the issuance yield.

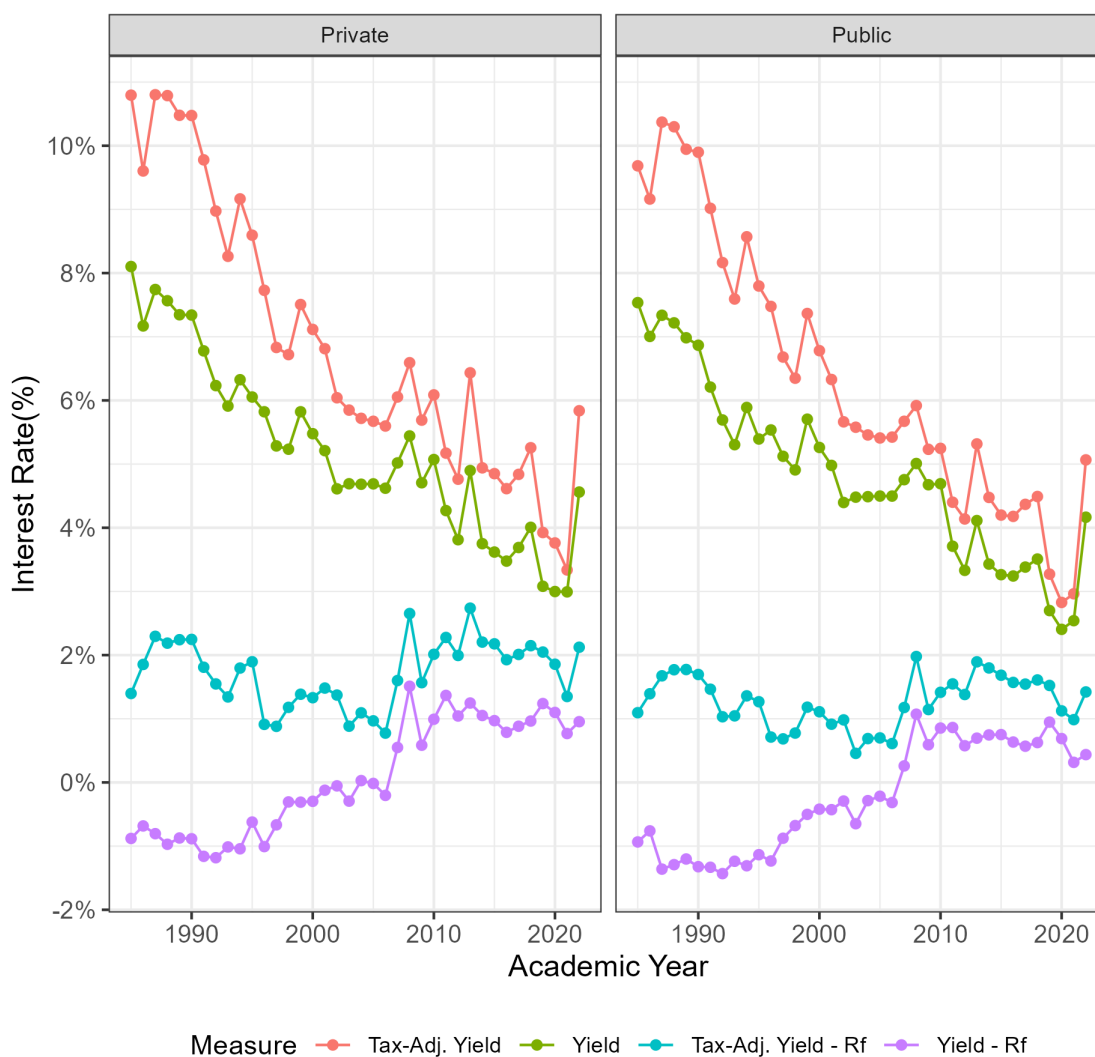
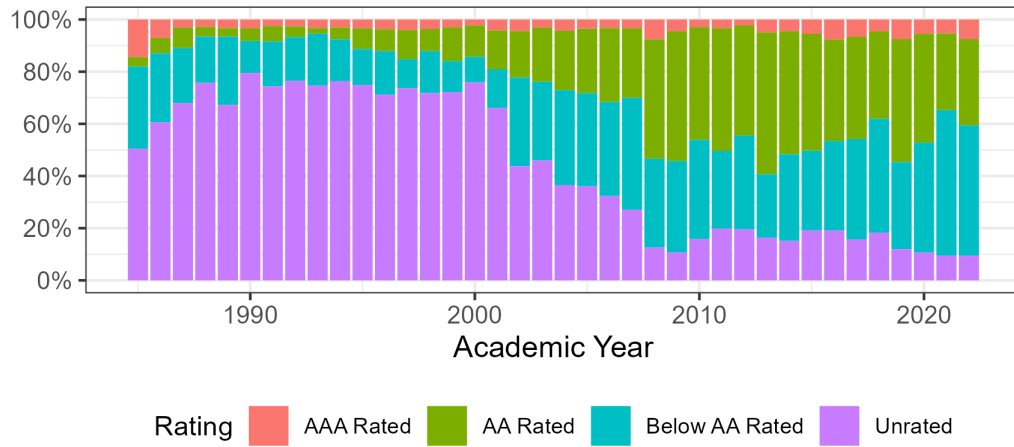


Figure 5: Rating of Underlying Issuer Versus Bond Rating

This figure shows the composition of ratings for the the underlying university issuer in Panel A, and Panel B shows the actual rating of the bond issuance.

A



B

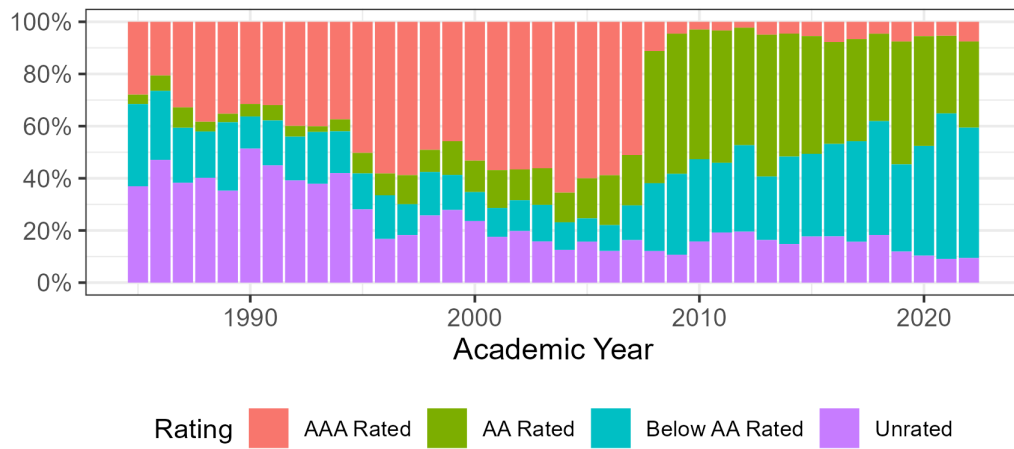


Table 1: Issuance Panel: Descriptive Statistics

This table presents the summary statistics for the sample of bond issuances and the underlying university issuer. Panel A describes the characteristics of the bond issuance including its yield, features, and ratings. Panel B describes the characteristics of the university issuer including its type and prestige. Panel C contains information regarding the university issuer's financial condition based on its balance sheet, leverage, and revenue concentration.

Panel A: Bond Characteristics								
	N	Mean	SD	Min	p25	Median	p75	Max
<i>Yield Measures</i>								
Issuance Yield	9473	4.67	1.51	1.25	3.61	4.70	5.60	8.30
Issuance Yield Tax-Adjusted	9266	6.08	2.18	1.52	4.59	5.85	7.29	11.43
Issuance Yield Less Risk Free Rate	9473	0.04	1.08	-2.09	-0.75	-0.01	0.77	3.27
Issuance Yield Tax-Adjusted Less Risk Free Rate	9266	1.41	0.90	-0.61	0.83	1.32	1.92	4.50
<i>Bond Characteristics</i>								
Years to Maturity	9473	21.26	8.58	0.98	16.00	21.17	29.62	37.97
Issue Amount	9473	67.62	110.95	1.25	11.94	27.80	70.00	702.28
Gross Spread	6704	7.49	4.78	0.00	4.13	6.18	9.98	22.50
Negotiated Bid	9473	0.79	0.40	0.00	1.00	1.00	1.00	1.00
Callable Issue	9473	0.85	0.35	0.00	1.00	1.00	1.00	1.00
Refinancing or Refunding Flag	9473	0.44	0.50	0.00	0.00	0.00	1.00	1.00
Tax-Exempt	9473	0.88	0.33	0.00	1.00	1.00	1.00	1.00
Sinking Fund	9473	0.54	0.50	0.00	0.00	1.00	1.00	1.00
Revenue Bond	9473	0.94	0.23	0.00	1.00	1.00	1.00	1.00
Insured	9473	0.26	0.44	0.00	0.00	0.00	1.00	1.00
<i>Bond Ratings</i>								
Ratings Combined Underlying	9473	3.32	2.75	0.00	0.00	5.00	6.00	7.00
Ratings Combined	9473	4.71	2.58	0.00	4.00	6.00	7.00	7.00
AAA Rated Underlying	9473	0.04	0.21	0.00	0.00	0.00	0.00	1.00
AA Rated Underlying	9473	0.27	0.44	0.00	0.00	0.00	1.00	1.00
Below AA Rated Underlying	9473	0.29	0.45	0.00	0.00	0.00	1.00	1.00
Unrated Underlying	9473	0.39	0.49	0.00	0.00	0.00	1.00	1.00
Panel B: Issuer Characteristics								
<i>University Type</i>								
Public	9473	0.62	0.49	0.00	0.00	1.00	1.00	1.00
NCAA Division I	9473	0.63	0.48	0.00	0.00	1.00	1.00	1.00
R1	9473	0.41	0.49	0.00	0.00	0.00	1.00	1.00
System	9473	0.35	0.48	0.00	0.00	0.00	1.00	1.00
HBCU	9473	0.02	0.14	0.00	0.00	0.00	0.00	1.00
Land Grant	9473	0.20	0.40	0.00	0.00	0.00	0.00	1.00
Hospital	9473	0.13	0.34	0.00	0.00	0.00	0.00	1.00
<i>University Prestige</i>								
Total Enrollment	9013	16.79	13.72	0.71	4.38	12.95	26.54	53.29
Proportion Admitted to Applied	5936	0.66	0.21	0.04	0.55	0.70	0.81	1.00
Average SAT	5147	11.57	1.33	8.60	10.65	11.45	12.35	14.90
Panel C: Issuer Financial Characteristics								
<i>Balance Sheet</i>								
Assets	6672	1.86	3.13	0.03	0.27	0.73	2.05	19.71
Liabilities	6672	0.67	1.08	0.01	0.09	0.26	0.81	6.86
Long-term Debt	5925	0.37	0.50	0.00	0.07	0.17	0.46	2.82
Value of Endowment	6961	0.66	1.57	0.00	0.03	0.14	0.58	10.81
<i>Leverage Ratios</i>								
Long-term Debt/Assets	5918	0.25	0.12	0.00	0.16	0.23	0.33	0.60
Liabilities/Assets	6672	0.40	0.19	0.09	0.27	0.37	0.48	1.09
Endowment/Assets	5301	0.29	0.20	0.00	0.13	0.26	0.41	0.87
<i>Revenue Concentration</i>								
HHI Non-Financial Income	9325	0.40	0.15	0.21	0.29	0.36	0.48	1.00
HHI Revenue	9218	0.38	0.15	0.17	0.27	0.33	0.45	1.00

Table 2: Issuance Panel: Descriptive Statistics by University Type

This table presents the summary statistics for the sample of bond issuances and the underlying university issuer across university types. Values displayed in the table coincide with the mean value for the respective university type. Panel A describes the characteristics of the bond issuance including its yield, features, and ratings. Panel B describes the characteristics of the university issuer including its balance sheet, leverage, and prestige. Panel C contains information regarding the university issuer's scaled revenues and revenue concentration.

University Type:	Public	Private	HBCU	R1	System	Hospital	NCAA D1
% of Observations:	62%	38%	2%	41%	35%	13%	63%
Panel A: Bond Characteristics							
<i>Yield Measures</i>							
Issuance Yield	4.50	4.96	5.00	4.57	4.57	4.57	4.58
Issuance Yield Tax-Adjusted	5.81	6.52	6.40	5.90	5.90	5.88	5.92
Issuance Yield Less Risk Free Rate	-0.03	0.15	0.18	-0.17	-0.05	-0.12	-0.07
Issuance Yield Tax-Adjusted Less Risk Free Rate	1.26	1.66	1.60	1.14	1.25	1.19	1.25
<i>Bond Characteristics</i>							
Gross Spread	7.12	8.04	8.20	6.38	6.94	6.67	6.93
Years to Maturity	20.47	22.53	22.06	20.69	20.83	20.68	20.92
Issue Amount	76.09	53.97	32.69	107.02	96.60	154.64	83.37
Negotiated Bid	0.71	0.93	0.89	0.73	0.73	0.78	0.73
Callable Issue	0.84	0.87	0.85	0.83	0.85	0.80	0.85
Refinancing or Refunding Flag	0.42	0.45	0.46	0.43	0.41	0.40	0.43
Tax-Exempt	0.86	0.91	0.88	0.85	0.84	0.83	0.86
Sinking Fund	0.50	0.59	0.60	0.48	0.51	0.48	0.51
Revenue Bond	0.93	0.96	0.98	0.91	0.94	0.86	0.93
Insured	0.31	0.17	0.46	0.24	0.29	0.20	0.29
<i>Bond Ratings</i>							
Rating Underlying	3.64	2.80	2.14	4.18	3.81	3.92	3.81
Rating Combined	5.25	3.85	4.72	5.43	5.35	4.97	5.30
AAA Rated Underlying	0.04	0.06	0.01	0.09	0.05	0.07	0.06
AA Rated Underlying	0.36	0.13	0.11	0.46	0.42	0.44	0.36
Below AA Rated Underlying	0.25	0.35	0.30	0.17	0.19	0.16	0.26
Unrated Underlying	0.35	0.46	0.58	0.29	0.34	0.33	0.33
Panel B: Issuer Characteristics							
<i>Balance Sheet Measures</i>							
Assets	1.96	1.73	0.30	4.03	2.07	5.78	2.56
Liabilities	0.79	0.51	0.13	1.42	0.81	2.15	0.93
Interest Expense	17.08	12.21	3.04	30.31	18.96	48.76	20.03
Long-term Debt	0.40	0.31	0.08	0.72	0.41	1.07	0.48
Value of Endowment	0.60	0.79	0.05	1.34	0.70	1.76	0.85
Long-term Debt/Assets	0.26	0.23	0.28	0.23	0.24	0.22	0.24
Liabilities/Assets	0.45	0.33	0.46	0.39	0.43	0.40	0.41
Endowment/Assets	0.23	0.40	0.14	0.34	0.25	0.34	0.28
<i>University Prestige</i>							
Total Enrollment	23.02	6.26	5.15	28.49	25.11	26.99	23.37
Proportion Admitted to Applied	0.70	0.58	0.58	0.62	0.67	0.52	0.66
Average SAT	11.34	11.98	9.10	12.24	11.57	12.49	11.70
Panel C: Scaled Revenues (% Total Revenues)							
% State Revenue	0.40	0.05	0.35	0.31	0.40	0.23	0.33
% Federal Revenue	0.14	0.09	0.25	0.16	0.15	0.14	0.14
% Net Tuition Revenue	0.19	0.32	0.17	0.17	0.18	0.13	0.21
% Gift Revenue	0.05	0.13	0.07	0.08	0.06	0.07	0.07
% Other Revenue	0.20	0.18	0.13	0.25	0.20	0.40	0.21
% Financial Revenue	0.02	0.23	0.03	0.03	0.02	0.04	0.04
<i>Revenue Concentration</i>							
HHI Revenue	0.36	0.43	0.35	0.34	0.36	0.36	0.36

Table 3: Explaining Bond Features

This table presents the OLS regression coefficients from regressing a bond's characteristics on university, financial conditions, and other state characteristics. The dependent variable in column (1) is the underlying rating of the issuer at issuance, (2) is an indicator for whether the issuance is refinancing or refunding a prior issuance, (3) is an indicator for whether the bond issuance is insured, (4) to (5) is the logarithm of the total issuance amount, and (6) to (7) the logarithm of the total maturity. The regressions include *Issuer Type Controls* based on the ultimate issuer of the bond (e.g., university or state issuer). Regressions include variations of state and year and state \times year fixed effects. Standard errors are clustered at the state and year level. ***, **, * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Und. Rating	Refinance	Insured	Log(Amount)		Log(Maturity)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Public	0.39 [0.25]	-0.07** [0.03]	0.18*** [0.05]	-0.37* [0.20]	-0.31 [0.20]	-0.05 [0.06]	-0.05 [0.06]
30-Year R_f Rate	-0.19** [0.08]	-0.06** [0.03]	-0.01 [0.01]	-0.11** [0.04]	-0.09** [0.04]	-0.09*** [0.03]	-0.08*** [0.03]
Average SAT	0.42*** [0.07]	0.02* [0.01]	0.04*** [0.02]	0.01 [0.04]	0.00 [0.04]	0.08*** [0.03]	0.08*** [0.02]
HHI Revenue	-1.36*** [0.39]	0.12* [0.07]	0.12 [0.08]	-0.13 [0.19]	0.00 [0.23]	0.33** [0.14]	0.31** [0.13]
Log(Revenue)	0.43*** [0.14]	-0.03 [0.02]	-0.08*** [0.02]	0.28*** [0.06]	0.33*** [0.06]	-0.16*** [0.05]	-0.18*** [0.05]
Log(Enrollment)	-0.05 [0.17]	0.02 [0.02]	0.09*** [0.02]	0.17** [0.07]	0.11 [0.07]	0.16*** [0.05]	0.16*** [0.05]
Underlying Rating		0.01*** [0.00]	-0.05*** [0.01]	0.04*** [0.01]	0.03** [0.01]	0.06** [0.02]	0.07** [0.03]
State Economic Activity				0.01* [0.01]		-0.00 [0.00]	
State Unemployment Rate				0.01 [0.03]		-0.02* [0.01]	
State Credit Rating				-0.05** [0.02]		-0.05*** [0.01]	
Observations	8320	8320	8320	8240	8320	8240	8320
Adjusted R^2	0.50	0.14	0.47	0.52	0.57	0.15	0.19
Year & State F.E.	No	No	No	Yes	No	Yes	No
Year \times State F.E.	Yes	Yes	Yes	No	Yes	No	Yes
Issuer Type Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Y-mean	3.30	0.44	0.27	3.39	3.37	2.89	2.88

Table 4: Explaining Issuance Yields

This table presents the OLS regression coefficients from regressing a bond's issuance yield on university, financial conditions, and other state characteristics. The dependent variable in columns (1) to (7) is the yield at issue for a given bond. The regressions include *Issuer Type Controls* based on the ultimate issuer of the bond (e.g., university or state issuer), and *Bond Controls* based on characteristics of the bond (e.g., taxable, sinking fund, insured). Regressions include variations of year and state, state \times year, state \times year \times rating, and county \times year \times rating fixed effects. Standard errors are clustered at the state and year level. ***, **, * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Yield							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public	-0.35*** [0.07]	-0.26*** [0.05]	-0.18*** [0.04]	-0.15*** [0.04]	-0.21*** [0.04]	-0.28*** [0.07]	-0.16** [0.07]	-0.56*** [0.16]
State Economic Activity	-0.01** [0.00]							
State Unemployment Rate	0.04** [0.02]							
Log(Maturity)		0.67*** [0.06]	0.69*** [0.05]	0.69*** [0.05]	0.67*** [0.05]	0.75*** [0.08]	0.77*** [0.09]	0.80*** [0.11]
Log(Issue Amount)		-0.06*** [0.01]	-0.08*** [0.01]	-0.08*** [0.01]	-0.04*** [0.01]	-0.02 [0.01]	-0.02 [0.02]	-0.05 [0.03]
Underlying Rating			-0.06*** [0.01]	-0.06*** [0.01]	-0.04*** [0.01]	-0.05*** [0.01]	0.00 [0.00]	-0.01 [0.01]
Public \times Taxable				-0.30*** [0.10]				
Average SAT					-0.09*** [0.02]	-0.10*** [0.03]	-0.07** [0.03]	0.02 [0.06]
HHI Revenue					0.19* [0.10]	0.22 [0.19]	0.04 [0.22]	-0.20 [0.34]
Log(Revenue)					-0.03 [0.02]	-0.03 [0.03]	-0.02 [0.02]	0.12* [0.06]
Long-Term Debt/Assets						0.27 [0.19]	0.36* [0.19]	1.34** [0.59]
Log(Endowment)						-0.02 [0.02]	0.00 [0.01]	-0.17*** [0.05]
Observations	9439	9185	9185	9185	8615	5051	4399	2786
Adjusted R^2	0.68	0.78	0.84	0.84	0.85	0.75	0.80	0.84
Year & State F.E.	Yes	No	No	No	No	No	No	No
Year \times State F.E.	No	Yes	Yes	Yes	Yes	Yes	No	No
Year \times State \times Rating F.E.	No	No	No	No	No	No	Yes	No
Year \times County \times Rating F.E.	No	No	No	No	No	No	No	Yes
Issuer Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond Controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Y-mean	4.67	4.65	4.65	4.65	4.66	3.90	3.88	3.84

Table 5: Explaining University Leverage

This table presents the OLS regression coefficients from regressing a university's leverage on a university's revenue composition and other university characteristics. The dependent variable in columns (1) to (3) is *Long-term Debt/Assets*_{t+1} and columns (4) to (6) is *Liabilities/Assets*_{t+1}. The regressions include *University Controls* based on a university's endowment, enrollment, and revenue. Regressions include state × year fixed effects. Standard errors are clustered at the state and year level. ***, **, * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Long-Term Debt/Assets _{t+1}			Liabilities/Assets _{t+1}		
	(1)	(2)	(3)	(4)	(5)	(6)
% Government Revenue	-0.06** [0.03]			-0.20*** [0.07]		
% State Revenue		-0.10 [0.07]	0.03 [0.07]		-0.26 [0.15]	0.19* [0.10]
Public × % State Revenue			-0.17* [0.08]			-0.71*** [0.21]
% Federal Revenue		-0.05* [0.03]	-0.06** [0.03]		-0.23 [0.13]	0.00 [0.08]
Public × % Federal Revenue			-0.00 [0.08]			-0.90*** [0.26]
% Net Tuition Revenue	0.01 [0.02]	0.00 [0.02]	-0.00 [0.02]	0.04 [0.04]	0.03 [0.04]	-0.00 [0.03]
% Gift Revenue	-0.03* [0.01]	-0.03*** [0.01]	-0.04*** [0.01]	-0.03 [0.03]	-0.05* [0.02]	-0.09*** [0.02]
% Other Revenue	0.01 [0.02]	0.01 [0.01]	0.00 [0.01]	0.12** [0.06]	0.11* [0.05]	0.03 [0.04]
% Financial Revenue	-0.01 [0.01]	-0.01 [0.01]	-0.02 [0.01]	-0.03 [0.04]	-0.04 [0.04]	-0.07 [0.04]
Observations	28507	28507	28507	31583	31583	31583
Adjusted R ²	0.74	0.74	0.74	0.77	0.77	0.77
University Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year × State F.E.	Yes	Yes	Yes	Yes	Yes	Yes
University Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Y-mean	0.22	0.22	0.22	0.36	0.36	0.36

Table 6: Implications of University Leverage

This table presents the OLS regression coefficients from regressing university characteristics on its leverage. Panel A includes measures of quality and capacity as the dependent variable which include column (1) as the percentage of quality expenses, (2) as the ratio of quality to academic expenses, (3) as the logarithm of the ratio of quality expenses scaled by enrollment, and (4) as the university's dormitory capacity. Panel B includes measures relating to the cost and enrollment as the dependent variable which include column (1) as the logarithm of in-state tuition, (2) as the logarithm of out-state tuition, (3) as the logarithm of enrollment, and (4) as the logarithm of out-state enrollment. The independent variable of interest is *Long-term Debt/Assets* which represents a university's leverage. The regressions include *Controls* based on a university's endowment, enrollment, revenue, and revenue sources. Regressions include state \times year and university fixed effects. Standard errors are clustered at the state and year level. ***, **, * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Quality & Capacity				
	Quality Expense (%) _{t+1}	Quality/Academic Exp. _{t+1}	Log(Quality Expense/Enrollment) _{t+1}	Log(Dormitory Capacity) _{t+1}
	(1)	(2)	(3)	(4)
Long-Term Debt/Assets _t	0.01* [0.00]	0.04* [0.02]	0.15*** [0.03]	0.23*** [0.04]
Controls	Yes	Yes	Yes	Yes
Observations	28200	28200	26452	25283
Adjusted R^2	0.90	0.85	0.91	0.97
Year \times State F.E.	Yes	Yes	Yes	Yes
University Fixed Effects	Yes	Yes	Yes	Yes
Y-mean	0.25	0.60	8.60	6.96
Panel B: Cost and Enrollment				
	Log(In-State Tuition) _{t+1}	Log(Out-State Tuition) _{t+1}	Log(Enrollment) _{t+1}	Log(Enrollment Out-State) _{t+1}
	(1)	(2)	(3)	(4)
Long-Term Debt/Assets	0.08*** [0.03]	0.01 [0.02]	0.01 [0.01]	0.18** [0.06]
Controls	Yes	Yes	Yes	Yes
Observations	25871	25871	26644	19574
Adjusted R^2	0.98	0.94	1.00	0.94
Year \times State F.E.	Yes	Yes	Yes	Yes
University Fixed Effects	Yes	Yes	Yes	Yes
Y-mean	9.69	9.97	7.89	4.72

Appendix

Variable Definition

Figure A.1: Issuer Type by University Status

This figure shows the proportion of issuances for private and public university issuers across the three most common issuer types including *College*, *Local Authority*, *State Authority*.

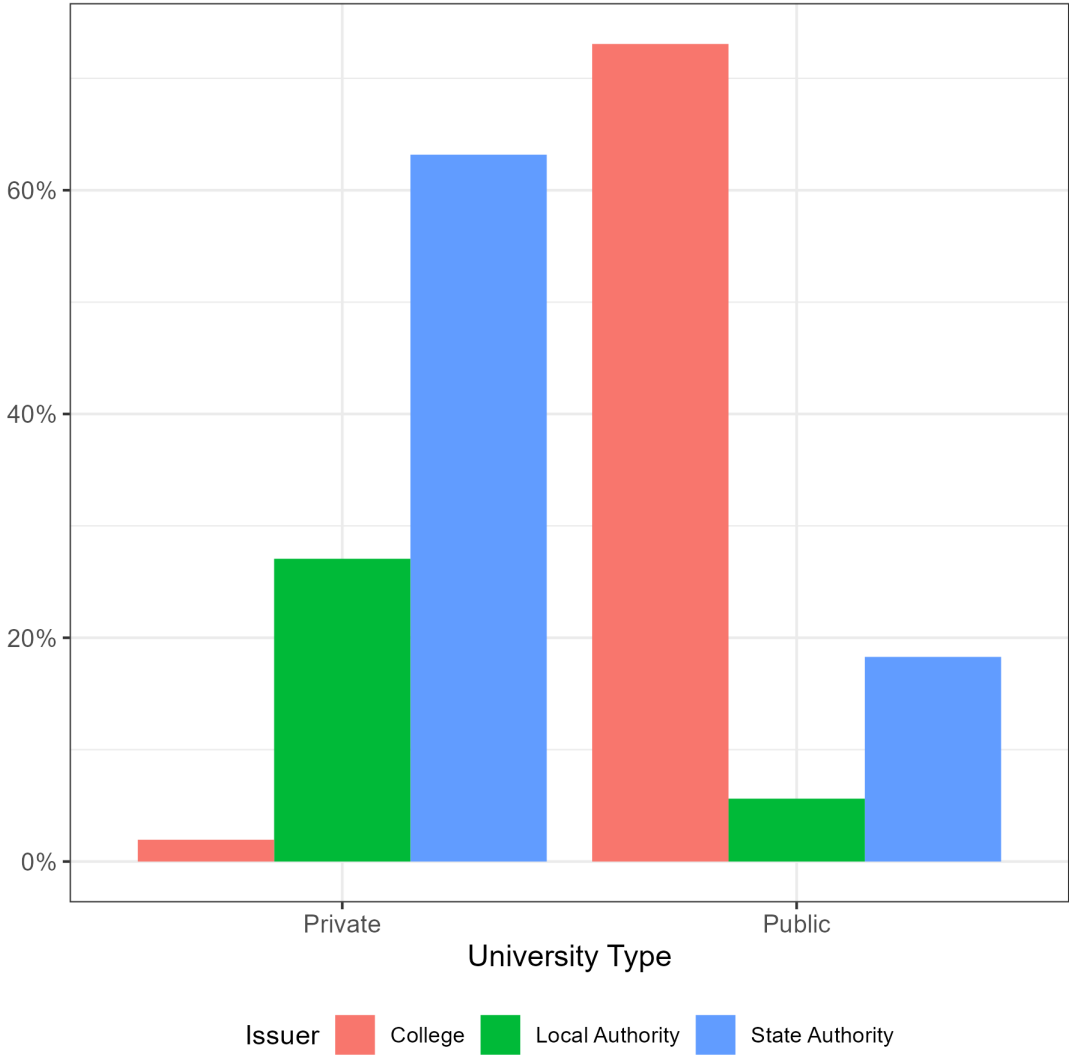


Figure A.2: Taxable Debt Issuances Across Private and Public Universities

This figure shows the percent of taxable issuances within a given year across private and public universities versus the average net margin for issuing universities.

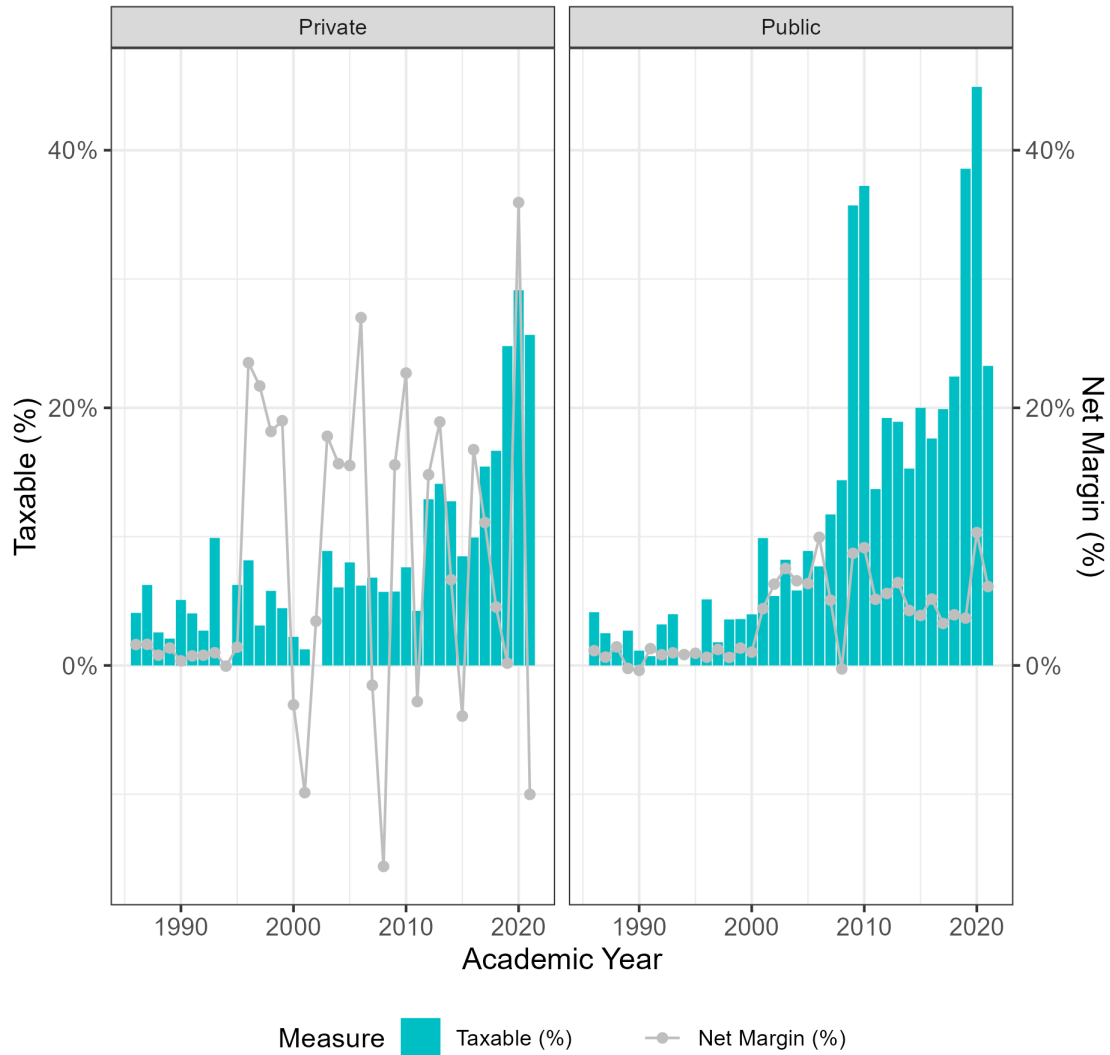
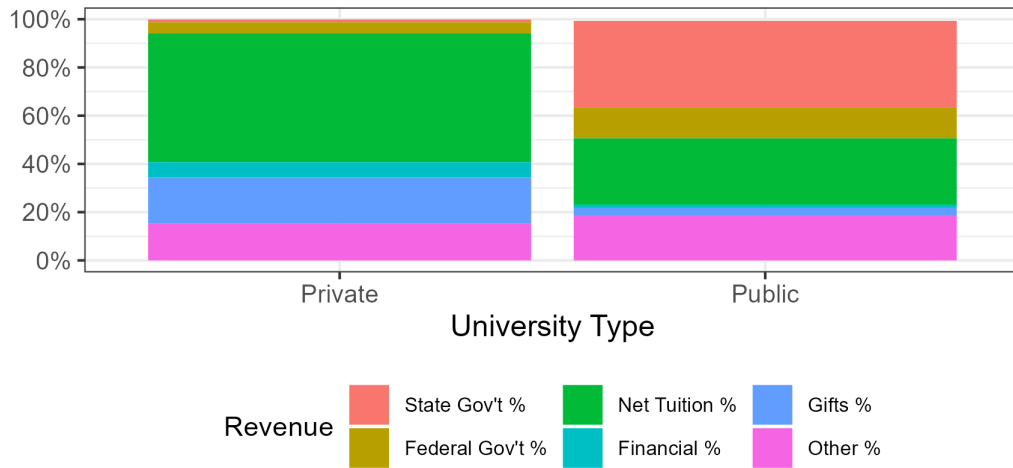


Figure A.3: Scaled Revenues and Expenses Across Private and Public Universities

This figure shows the composition of revenues and expense sources across private and public universities in the IPEDS sample. Panel A displays the average breakdown of revenues, and Panel B displays the average breakdown of expenses.

A



B

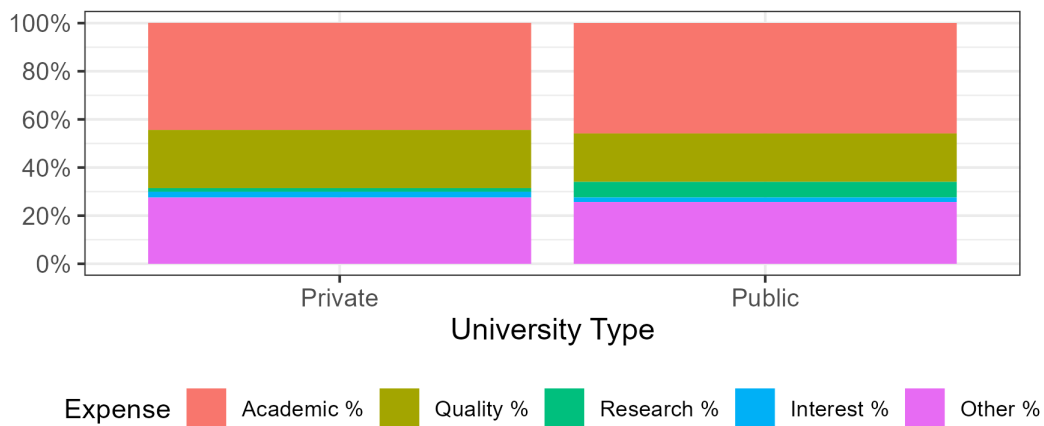


Figure A.4: Scaled Revenues Across Private and Public Universities Over Time

This figure shows the composition of revenues sources within each year across private and public universities in the IPEDS sample.



Figure A.5: Scaled Expenses Across Private and Public Universities Over Time

This figure shows the composition of expense sources within each year across private and public universities in the IPEDS sample.

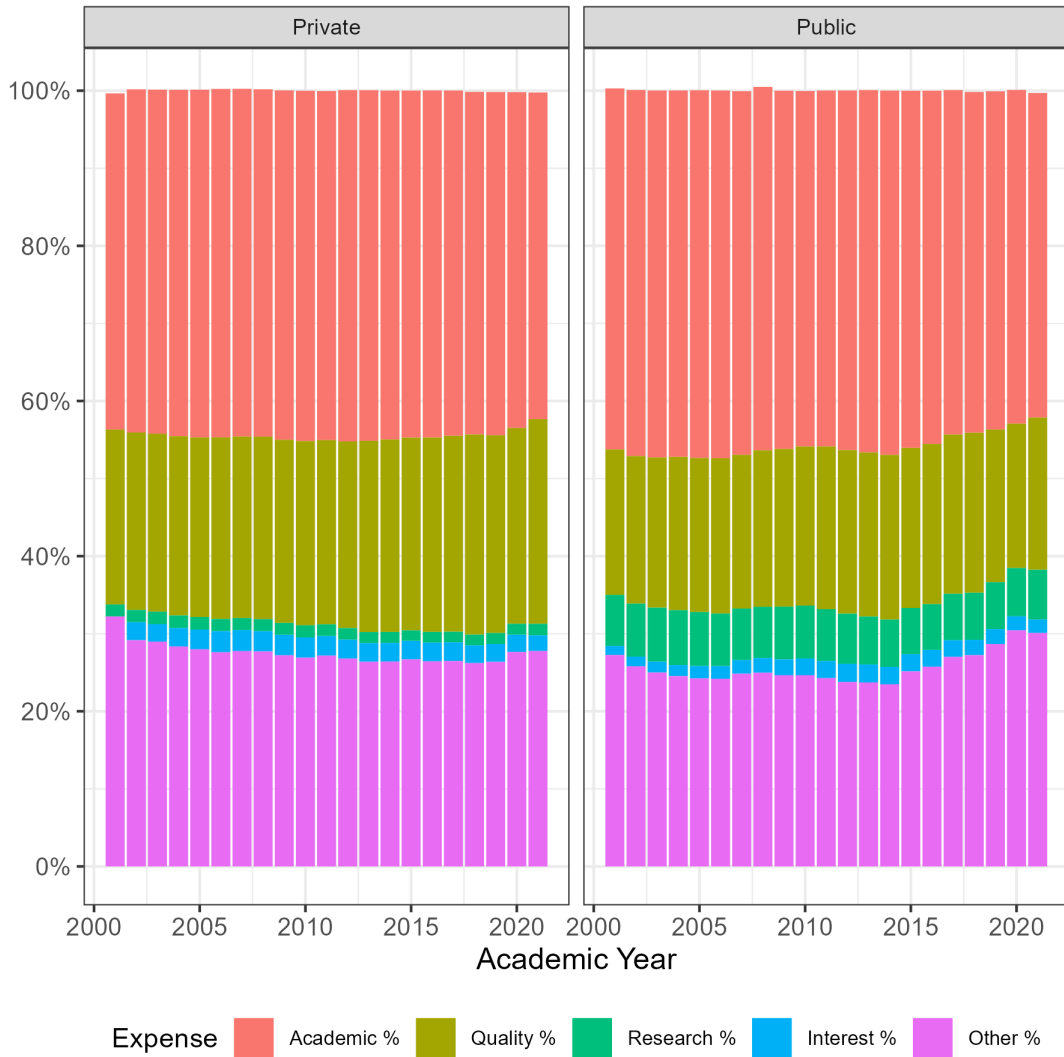


Figure A.6: Insured Issuances Over Time

This figure shows the proportion of insured bond issuances over time.

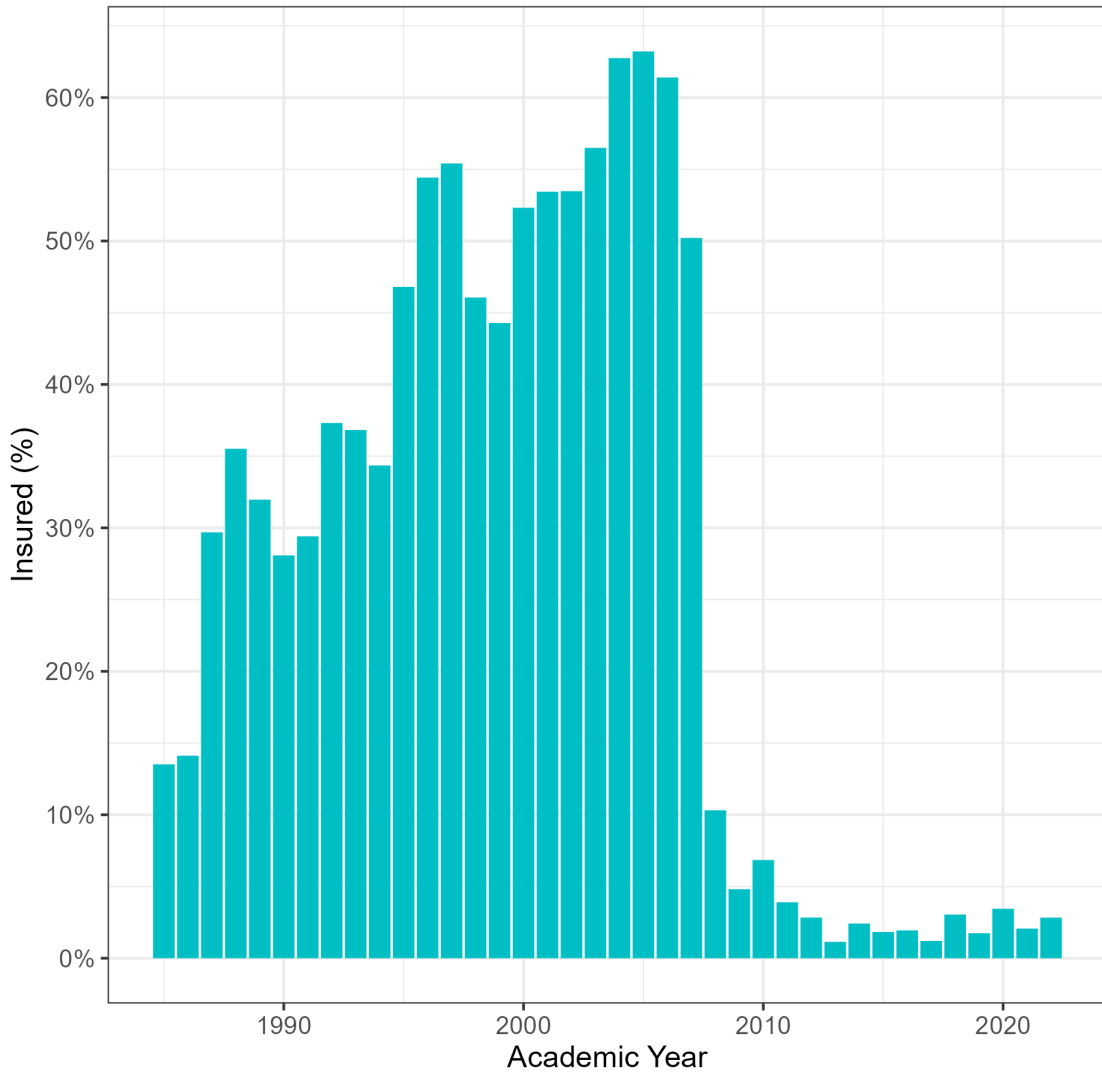


Table A.1: Issuance Panel: Absolute and Scaled Revenues and Expenses

This table presents the summary statistics for the sample of bond issuances and the underlying university issuer. Panel A displays the composition of total revenues, Panel B displays the composition of revenues as a percentage of total revenues. Panel C displays the composition of total expenses, Panel B displays the composition of revenue as a percentage of total expenses.

	N	Mean	SD	Min	p25	Median	p75	Max
Panel A: Absolute Revenue								
Federal Appropriations	9473	79.18	136.66	0.00	1.66	16.55	93.09	686.23
State Appropriations	9473	131.63	183.91	0.00	1.12	55.45	195.63	906.59
Net Tuition Revenue	9473	105.29	167.74	-258.24	17.61	55.61	151.71	802.97
Gift Revenue	9473	43.80	80.17	0.00	3.23	13.16	47.39	491.81
Other Revenue	9473	194.84	463.97	0.00	7.19	28.40	162.69	2,983.81
Financial Revenue	9473	34.04	116.96	-127.53	0.05	2.53	16.14	829.78
Total Revenue	9325	629.74	989.89	3.23	74.63	232.70	761.96	5,621.92
Panel B: Scaled Revenues (% Total Revenue)								
% State Revenue	9325	0.27	0.25	0.00	0.01	0.25	0.42	0.88
% Federal Revenue	9325	0.12	0.10	0.00	0.03	0.11	0.17	0.45
% Net Tuition Revenue	9325	0.26	0.24	0.00	0.00	0.24	0.41	0.89
% Gift Revenue	9325	0.09	0.10	0.00	0.03	0.06	0.11	0.50
% Other Revenue	9325	0.20	0.15	0.00	0.09	0.16	0.24	0.75
% Financial Revenue	9325	0.06	0.13	-0.34	0.00	0.01	0.07	0.67
Panel C: Absolute Expenses								
Academic Expense	9473	236.37	332.82	0.00	36.76	107.79	295.98	1,801.58
Quality Expense	9473	96.15	119.12	0.00	18.94	49.00	127.56	638.21
Research Expense	9473	103.34	182.37	0.00	0.43	12.66	132.99	908.81
Interest Expense	5966	15.11	22.52	0.02	2.42	6.40	17.43	134.08
Total Other Expense	9213	202.73	429.39	2.77	18.38	56.22	169.88	2,677.47
Total Expenses	9213	656.32	986.77	12.27	84.36	254.32	802.99	5,548.78
Panel D: Scaled Expenses (% Total Expenses)								
% Academic Expense	9213	0.42	0.10	0.15	0.36	0.42	0.49	0.64
% Quality Expense	9213	0.21	0.09	0.04	0.15	0.20	0.27	0.43
% Research Expense	9213	0.09	0.10	0.00	0.01	0.05	0.16	0.37
% Interest Expense	5947	0.02	0.02	0.00	0.01	0.02	0.03	0.09
% Total Other Expense	9213	0.26	0.13	0.07	0.17	0.23	0.33	0.69

Table A.2: IPEDS Sample Descriptive Statistics

This table presents the summary statistics for the IPEDS sample. Panel A displays the financial characteristics of universities from the balance sheet and income statement. Panel B displays the composition of absolute revenue and scaled revenue, and Panel C displays the composition of absolute expenses and scaled expenses.

Panel A: Income Statement and Balance Sheet Items								
	N	Mean	SD	Min	p25	Median	p75	Max
Total Revenue	72002	124.09	316.96	0.06	5.17	25.66	85.80	2,229.73
Total Expenses	70035	135.18	329.99	0.44	10.48	32.12	94.75	2,287.29
Net Income	70024	9.65	36.90	-46.31	-0.13	0.55	5.21	269.17
% Net Income	70023	0.04	0.19	-0.93	-0.01	0.03	0.11	0.58
Assets	46697	0.41	1.03	0.00	0.03	0.10	0.30	7.46
Liabilities	46585	0.14	0.36	0.00	0.01	0.03	0.10	2.42
Long-Term Debt	36917	0.09	0.20	0.00	0.01	0.02	0.08	1.29
Value of Endowment	40453	0.14	0.41	0.00	0.01	0.02	0.07	3.08
Endowment/Assets	30023	0.29	0.21	0.00	0.11	0.24	0.43	0.85
Liabilities/Assets	46584	0.34	0.24	0.01	0.18	0.30	0.45	1.36
Long-Term Debt/Assets	35393	0.22	0.17	0.00	0.10	0.19	0.30	0.84
Panel B: Revenue Sources								
Total Gov't Appropriations	84033	30.73	90.35	0.00	0.00	0.84	9.48	593.83
State Appropriations	84033	21.08	60.05	0.00	0.00	0.06	6.37	385.06
Federal Appropriations	84033	12.43	43.46	0.00	0.00	0.52	3.52	312.90
Net Tuition Revenue	84033	23.19	55.08	-80.47	0.13	6.57	24.83	336.43
Gift Revenue	84033	8.12	23.55	0.00	0.13	1.42	5.02	175.49
Other Revenue	84033	25.23	95.05	0.00	0.07	1.30	8.92	736.70
Financial Revenue	84033	5.26	22.33	-21.27	0.00	0.12	1.65	172.72
Total Revenue	72002	124.09	316.96	0.06	5.17	25.66	85.80	2,229.73
<i>Scaled Revenues</i>								
% Government Revenue	72001	0.26	0.31	0.00	0.01	0.09	0.47	0.98
% State Revenue	72001	0.17	0.26	0.00	0.00	0.01	0.30	0.91
% Federal Revenue	72001	0.10	0.13	0.00	0.01	0.05	0.15	0.68
% Net Tuition Revenue	72001	0.31	0.30	0.00	0.00	0.26	0.55	1.00
% Gift Revenue	72001	0.18	0.21	0.00	0.03	0.10	0.26	0.92
% Other Revenue	72001	0.17	0.19	0.00	0.05	0.12	0.22	1.00
% Financial Revenue	72001	0.07	0.15	-0.40	0.00	0.01	0.09	0.69
Panel C: Expense Sources								
Academic Expense	84033	43.07	99.42	0.00	1.42	9.07	34.19	661.84
Quality Expense	84033	18.12	37.76	0.00	0.49	4.87	17.19	244.62
Research Expense	84033	12.66	50.79	0.00	0.00	0.00	0.63	362.21
Interest Expense	35227	3.88	8.56	0.00	0.20	0.95	3.25	55.89
Total Other Expense	70035	40.71	122.91	0.10	3.41	8.64	22.96	946.01
Total Expenses	70035	135.18	329.99	0.44	10.48	32.12	94.75	2,287.29
<i>Scaled Expenses</i>								
% Academic Expense	70035	0.42	0.12	0.13	0.34	0.42	0.50	0.78
% Quality Expense	70035	0.21	0.11	0.00	0.14	0.21	0.29	0.47
% Research Expense	70035	0.03	0.06	0.00	0.00	0.00	0.02	0.30
% Interest Expense	34715	0.02	0.02	0.00	0.01	0.02	0.03	0.10
% Total Other Expense	70035	0.32	0.15	0.06	0.20	0.30	0.43	0.77

Table A.3: IPEDS Panel: Descriptive Statistics by University Type

This table presents the summary statistics for IPEDS sample across university types. Panel A displays the composition of scaled revenues, and Panel B displays the government revenues per full-time enrolled student and mix of academic versus quality expenses. Panel C displays information across the university's financial and other characteristics, and Panel D displays information regarding a university's student base.

	Public	Private	HBCU	R1	System	Hospital	NCAA D1
	26%	74%	4%	7%	26%	4%	16%
Panel A: Revenue Sources							
% Government Revenue	0.59	0.13	0.51	0.44	0.49	0.30	0.44
% State Revenue	0.50	0.04	0.26	0.30	0.41	0.20	0.33
% Federal Revenue	0.14	0.09	0.28	0.17	0.12	0.12	0.13
% Net Tuition Revenue	0.16	0.37	0.18	0.15	0.21	0.15	0.22
% Gift Revenue	0.04	0.24	0.12	0.09	0.08	0.07	0.08
% Other Revenue	0.15	0.18	0.13	0.24	0.16	0.41	0.18
% Financial Revenue	0.01	0.09	0.03	0.06	0.02	0.04	0.05
Panel B: Academic vs. Amenities?							
Government Revenue Per FTE	15.29	2.79	12.10	15.35	13.89	42.63	8.14
Federal Revenue Per FTE	4.95	2.27	7.70	9.19	4.33	17.30	3.94
State Revenue Per FTE	11.68	0.56	5.00	6.89	10.72	28.73	4.82
Academic Expenses Per FTE	11.66	10.02	9.06	18.30	12.13	35.92	11.34
Quality Expenses Per FTE	3.79	4.80	4.60	6.62	3.89	6.69	5.26
% Academic Expense	0.44	0.42	0.35	0.38	0.44	0.33	0.42
% Quality Expense	0.19	0.22	0.22	0.15	0.19	0.09	0.21
Panel C: University Characteristics							
Tuition Growth	0.06	0.05	0.05	0.06	0.06	0.06	0.06
Enrollment Growth	0.01	0.02	0.01	0.01	0.02	0.01	0.01
Endowment Growth	0.17	0.10	0.13	0.14	0.16	0.14	0.15
Total Enrollment	10.88	2.08	2.93	22.08	8.47	12.79	15.12
Percent Enrollment In-State	0.82	0.58	0.64	0.61	0.80	0.60	0.69
Assets	0.71	0.32	0.17	3.23	0.52	2.50	1.41
Liabilities	0.30	0.09	0.06	1.09	0.22	0.90	0.51
Long-Term Debt	0.17	0.07	0.04	0.59	0.12	0.50	0.28
Value of Endowment	0.15	0.14	0.03	0.87	0.12	0.68	0.37
Endowment/Assets	0.16	0.35	0.18	0.35	0.19	0.29	0.26
Liabilities/Assets	0.46	0.31	0.38	0.37	0.43	0.40	0.39
Long-Term Debt/Assets	0.25	0.20	0.23	0.21	0.24	0.19	0.23
% Net Income	0.03	0.04	0.04	0.05	0.03	0.04	0.05
Panel D: Student Characteristics							
In State Tuition and Fees	5.17	16.90	7.17	12.89	7.00	12.64	11.77
Proportion Admitted to Applied	0.69	0.67	0.57	0.55	0.69	0.53	0.64
Average SAT	10.65	10.98	8.98	12.50	10.60	12.45	11.39
Repayment Rate	0.60	0.63	0.27	0.73	0.60	0.73	0.65
Default Rate	0.05	0.04	0.12	0.03	0.05	0.02	0.04
Completion Rate	0.46	0.56	0.34	0.70	0.46	0.70	0.59

Table A.4: Explaining University Issuer Choice

This table presents the OLS regression coefficients from regressing a university's choice of issuer on university and other state characteristics. The dependent variable in columns (1) and (2) is whether a university directly issues its own debt, columns (3) and (4) is whether a university uses a local government issuer to issue its debt, and columns (5) and (6) is whether a university uses a state authority to issue its debt. Regressions include variations of state and year and state \times year fixed effects. Standard errors are clustered at the state and year level. ***, **, * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Direct Issuer		Local Gov't Issuer		State Issuer	
	(1)	(2)	(3)	(4)	(5)	(6)
Public	0.62*** [0.07]	0.57*** [0.08]	-0.14** [0.07]	-0.07 [0.07]	-0.41*** [0.09]	-0.45*** [0.08]
Tax-Exempt	-0.04* [0.02]	-0.04 [0.02]	-0.03** [0.01]	-0.03*** [0.01]	0.08*** [0.03]	0.07** [0.03]
Insured	0.01 [0.03]	0.01 [0.03]	-0.02 [0.03]	-0.01 [0.02]	0.03 [0.03]	0.03 [0.03]
Underlying Ratings	0.01 [0.00]	-0.00 [0.00]	-0.01*** [0.00]	-0.01 [0.00]	0.01 [0.01]	0.01 [0.01]
State Economic Activity	0.00 [0.00]		-0.00 [0.00]		0.00 [0.00]	
State Unemployment Rate	-0.00 [0.01]		0.01 [0.01]		-0.01 [0.01]	
State Credit Rating	0.00 [0.00]		-0.01 [0.01]		0.01 [0.01]	
Average SAT		0.03*** [0.01]		-0.01** [0.00]		-0.01 [0.01]
Log(Enrollment)		0.05** [0.02]		-0.05** [0.02]		0.02 [0.03]
HHI Revenue		0.06 [0.09]		-0.07 [0.07]		0.03 [0.06]
Observations	9073	8320	9073	8320	9073	8320
Adjusted R^2	0.65	0.69	0.34	0.38	0.42	0.47
Year & State F.E.	Yes	No	Yes	No	Yes	No
Year \times State F.E.	No	Yes	No	Yes	No	Yes
Y-mean	0.46	0.47	0.14	0.14	0.35	0.35