Loan Outcomes among Pell Grant Students: A Comparison of HBCUs and non-HBCUs

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Introduction and Motivation

Introduction

- Pell grant helps low income students to help aid in their tuition costs. Although, since these grants are not enough, additional borrowing is needed by recipients, causing a long-term financial concerns.
- This research focuses on the disparities in student loan between Historically Black College and Universities (HBCUs) and non-HBCU, potentially finding any inequalities.
- Studies show high borrowing rates and low income leads to higher default rates but there haven't been studies which focuses institutional differences of students that default and we will do this by studying and comparing Pell grant recipients' loan behaviours across different institutions.
- ***Motivation -*** We wanted to understand if students at HBCUs face greater financial concerns than those from non-HBCUs.

Research Questions

1. How does the loan default rate vary between Pell Grant students in HBCUs and non-HBCUs, or is it relatively the same across all universities?
1. How does the loan debt differ by HBCU status?
2. How is Pell Grant debt associated with loan default and loan repayment rates, and does this association differ for HBCUs versus non-HBCUs after controlling for other institutional characteristics such as net cost, admissions rate, completion rate, retention rate, and median earnings?
3. Can we predict loan default risk using student-level data?

Exploratory Data Analysis

Data Description

College Scorecard: Project designed to increase transparency about Postsecondary institutions in the United States

Data used: institutional level data (**3305** variables and **6484** observations)

Collection of Data: through institutional reportings, financial aid, tax information

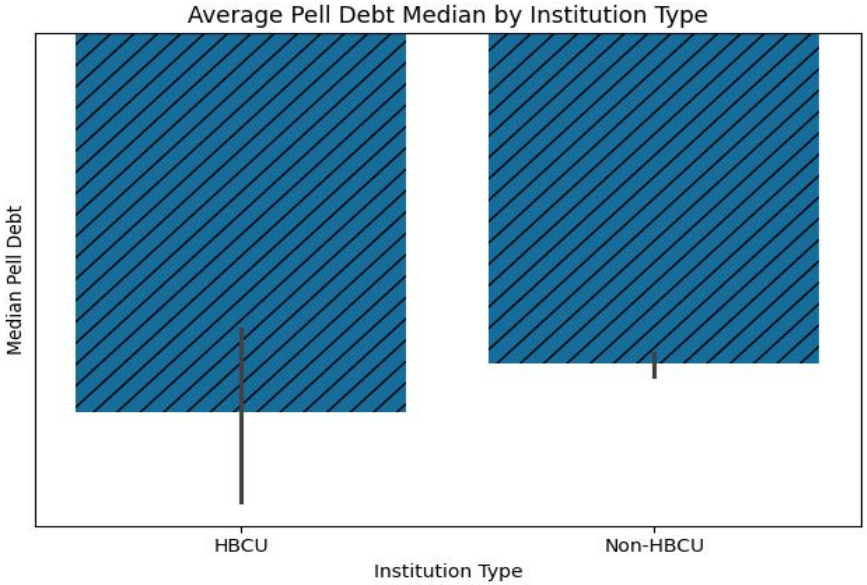
Data contains: basic information about the college, cost, financial aid, loan default rate, college completion rate, loan repayment rate, etc.

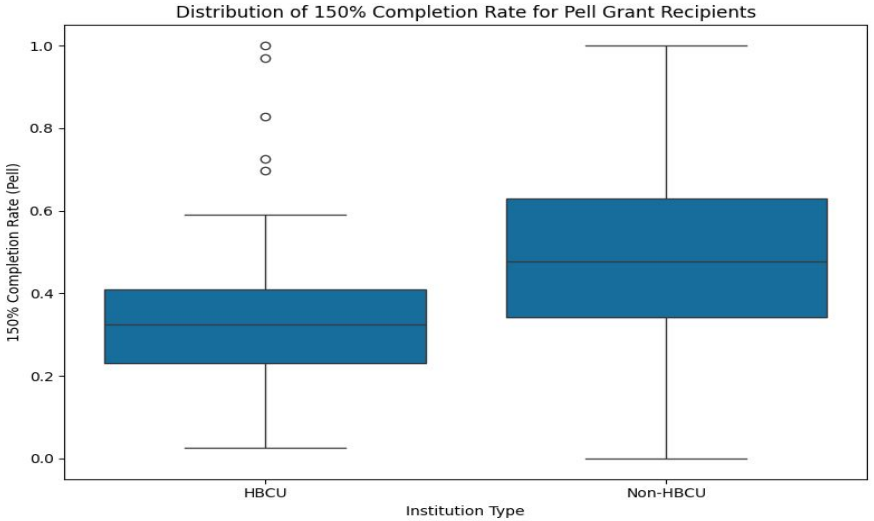
Focus: We were interested in loan debt, default and repayment rate for Pell Grant students in HBCUs and non-HBCUs. Hence all irrelevant variables, such as race, school location, school URL etc., were removed from the dataset

Relevant variables for our project

- **HBCU** - Historically Black Colleges and Universities
- **INSTNM** - Institution name
- **BBRR4_FED_PELL_DFLT** - Default rate for Pell Grant Students on BBRR (Borrower Based Repayment Rate) on Federal Loans after four years of entering repayment
- **PELL_DEBT_MDN** - Cumulative Median Student Debt for Pell Grant students
- **COSTT4_A** - Average cost of Attendance, Tuition, and Fees for academic year institutions
- **ADM_RATE** - Admission Rate
- **C150_4_PELL** - Completion rate for Pell Grant students who complete within 150 percent of their expected completion time (6 years for 4-year institutions)
- **RET_FT4** - Retention rate for full-time students in a 4-year institution
- **MD_EARN_WNE_P6** - Median entry cohort earnings 6 years after a student enrolls in college
- **BBRR4_FED_PELL_PAIDINFULL** - Rate of Pell Grant Students who paid their loans in full for BBRR on Federal Loans after four years of entering repayment

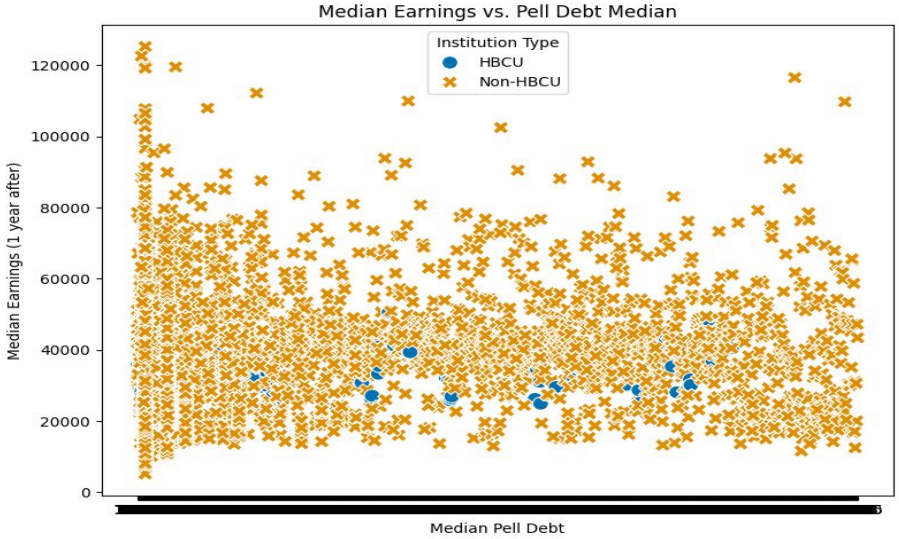
Exploratory Data Analysis - Loan Default rate

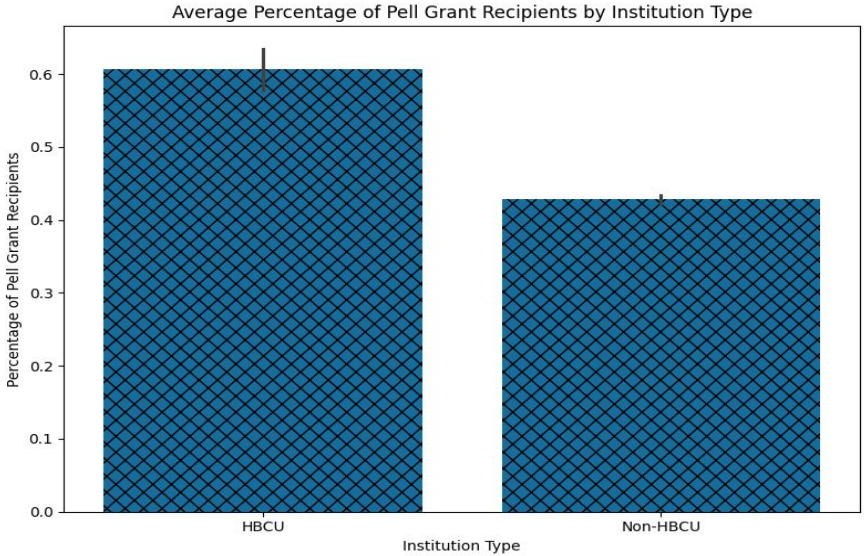




Median Debt for Pell Grant students in HBCUs is higher than those in non-HBCUs. Moreover, more Pell Grant students in non-HBCUs graduate in 6 years of entering college than those in HBCUs

Exploratory Data Analysis - Loan Default rate





Students from non-HBCUs generally earn higher than students from HBCUs

More students in HBCUs receive Pell Grants than those in non-HBCUs

Methods

Methods (Part 1) – Comparing Loan Outcomes

Analysis of Default and Repayment Rates

Box plots to compare distributions of default and repayment rates for Pell Grant students across HBCUs and non-HBCUs

Bar plots to illustrate mean differences

T-tests to test if differences in means are statistically significant

Simple Linear Regression to quantify:

- Average difference in default and repayment rates
- Generate R^2, p-values, F-statistics for deeper insights

Methods (Part 2) – Debt Analysis and Regression

Analysis of Loan Debt Differences

Box plots to compare median loan debt for Pell Grant students across HBCU and non-HBCU institutions

Welch's t-test to assess significance of debt differences

Simple OLS Regression to estimate average difference in debt amounts

Multiple Regression Model (Controlling for Factors)

Variables included:

- Pell Debt Median, HBCU status, Pell Debt * HBCU interaction
- Net Cost (COSTT4_A), Admission Rate (ADM_RATE)
- Completion Rate (C150_4_PELL), Retention Rate (RET_FT4)
- Median Earnings 6 years post-enrollment (MD_EARN_WNE_P6)

Goal: Control for institutional differences and explore complex relationships

Methods (Part 3) —Predicting Loan Default Risk (Synthetic Data)

Simulated individual-level data:

Academic factors: GPA, SAT score,

Financial factors: Family Income Level, Pell Grant Status

Institutional factors: HBCU Status, Net Cost, Admissions Rate, Completion Rate, Earnings

Logistic Regression model:

Inputs: student and institution characteristics

Output: Probability of student default

Purpose: Feasibility test for predictive modeling of loan default risk

Results

Results Overview

- Four research questions:
  - Compare default & repayment rates (HBCUs vs. non-HBCUs)
  - Assess median debt differences
  - Explore debt–outcome association controlling for institutional factors
  - Proof-of-concept predictive model using synthetic observations

Default & Repayment Rates

- HBCU Pell recipients default at significantly higher rates and repay at lower rates than non-HBCUs
- Default rate
  - $t = 11.624$, $p < 0.001$
  - OLS regression shows +10 percentage points for HBCU (coef=0.100, $p < 0.001$)
- Repayment rate
  - $t = -6.271$, $p < 0.001$
  - OLS shows –5.08 percentage points for HBCU (coef=–0.0508, $p < 0.001$)

Median Loan Debt

- HBCU median Pell debt is $1,660 higher (t = 3.148, p = 0.003; OLS coef=$1,660, p = 0.006)
- Although modest, this gap contrasts with much larger default-rate differences, implying other factors at play

Debt–Outcome Association

- Default model (R^2=0.495)
  - Higher debt → higher default ($p < 0.001$)
  - HBCU status main effect not significant (coef=0.0234, $p = 0.378$)
  - Debt × HBCU interaction marginally significant (coef=2.42×10^{-6}, $p = 0.078$)
- Repayment model (R^2=0.497)
  - Higher debt → lower repayment (coef=-2.87×10^{-6}, $p < 0.001$)
  - Neither HBCU main effect nor interaction significant
- Conclusion: Debt levels matter for outcomes, but the moderating effect of institution type is limited

Predicting Default Risk

- Generated synthetic individual observations (GPA, SAT, income, Pell status, HBCU status)
- Fitted logistic model: 90 % accuracy on test set
- Key predictors: higher GPA lowers default risk; Pell receipt and HBCU status both significant
- Note: synthetic observations illustrate proof-of-concept; real-data validation needed

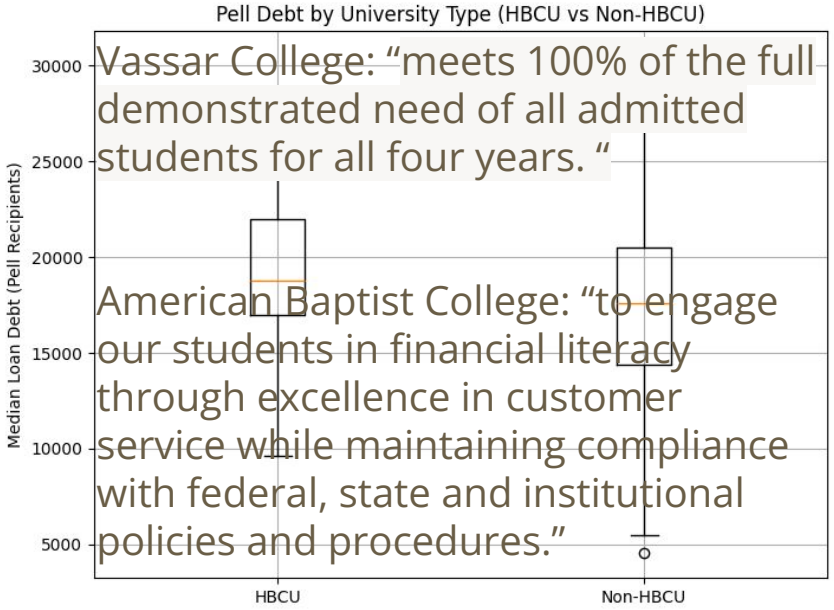
Results Key Takeaways

- Significant default and repayment gaps by institution type persist despite modest debt differences
- Regression controls show debt impacts outcomes, but interaction effects by HBCU status are weak
- Predictive modeling with individual observations is feasible for default risk, laying groundwork for deeper causal analysis
- Future work should investigate resource and support disparities driving elevated default risk at HBCUs

Discussions and Future Considerations

Discussions – Correlation or Causation?

- Median Debt Amount for Pell Grant Recipients at Vassar is $12,531
- Potentially a difference in an institution's mission
- Potentially the fault of Federal Endowments
  – $58 million vs $385 million



Vassar College: "meets 100% of the full demonstrated need of all admitted students for all four years. "

American Baptist College: "to engage our students in financial literacy through excellence in customer service while maintaining compliance with federal, state and institutional policies and procedures."

Future Research Considerations

1. Student-level data
    - High salary ≠ repaying debt
2. In-depth expenditure information at universities
    - Greater Endowments ≠ more financial aid
3. Longitudinal study examining how students fair at and after college
4. Matched Randomized Controlled Experiment
    - i.e. randomly assigning students to HBCU or non-HBCU